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پارسه



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“In the Name of God”

TECHNICAL ENGLISH

for

*Mechanical Engineering
Students*

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SECTION 1 READING SKILLS

Part A: General Rules

WHAT IS A PARAGRAPH?

A paragraph is a basic unit of organization in writing in which a group of related sentences develops one main idea. A paragraph can be as short as one sentence or as long ten sentences. The number of sentences is unimportant; however, the paragraph should be long enough to develop the main idea clearly.

The following model contains all of the elements of a good paragraph. Read it carefully two or three times and try to analyze its structure.

Model 1: Paragraph structure

Gold

Gold, a precious metal, is prized for two important characteristics. First of all, gold has a lustrous beauty that is resistant to corrosion. Therefore, it is suitable for jewelry, coins, and ornamental purposes. Gold never needs to be polished and will remain beautiful forever. For example, a Macedonian coin remains as untarnished today as the day it was minted twenty-three centuries ago. Another important characteristics of gold is its usefulness to industry and science. For many years, it has been used in hundreds of industrial applications. The most recent use of gold is in astronauts' suits. Astronauts wear gold-plated heat shields for protection outside the spaceship. In conclusion, gold is treasured not only for its beauty, but also for its utility.

THE THREE PARTS OF A PARAGRAPH

A paragraph has three major structural parts: a topic sentence, supporting sentences, and a controlling sentence.

The **topic sentence** states the main idea of the paragraph. It not only names the topic of the paragraph, but it also limits the topic to one or two areas that can be discussed completely in the space of a single paragraph. The specific area is called the controlling idea. Notice how the topic sentence of the model states both the topic and the controlling idea:

Topic Sentence	(Topic)	(Controlling Idea)
	<u>Gold, a precious metal, is prized for two important characteristics.</u>	

Supporting sentences develop the topic sentence. That is, they explain the topic sentence by giving reasons, examples, facts, statistics, and quotations. Some of the supporting sentences that explain the topic sentence about gold are:

Supporting Sentences

First of all, gold has a lustrous beauty that is resistant to corrosion. For example, a Macedonian coin remains as untarnished today as the day it was minted twenty-three centuries ago.

Another important characteristics of gold is its usefulness to industry and science.

The most recent application of gold is in astronauts' suits.

The concluding sentence signals the end of the paragraph and leaves the reader with important points to remember:

Concluding Sentence *In conclusion, gold is treasured not only for its beauty, but also for its utility.*

THE TOPIC SENTENCE

Every good paragraph has a topic sentence, which clearly states the topic and the controlling idea of the paragraph. It names the topic and then limits the topic to a specific area to be discussed in the space of a single paragraph. It is a complete sentence; that is, it contains a subject, a verb, and (usually) a complement. It is usually (but not always) the first sentence in the paragraph.

A topic sentence is the most important sentence in a paragraph. It briefly indicates what the paragraph is going to discuss. For this reason, the topic sentence is a helpful guide to both the writer and the reader. The writer can see what information to include (and what information to exclude). The reader can see what the paragraph is going to be about and is therefore better prepared to understand it.

The following examples show how a topic sentence states both the topic and the controlling idea in a complete sentence.

Driving on freeways requires skill and alertness.

Gold, a precious metal is prized for two important characteristics.

Registering for college classes can be a frustrating experience for new students.

POSITION OF TOPIC SENTENCES

The topic sentence may be the first or last sentence in a paragraph. The topic sentence may also be the first and last sentence of the paragraph--"sandwich-style." A "sandwich-style" paragraph is especially helpful to your reader if the paragraph is very long. The second topic sentence in the "sandwich-style" paragraph also serves as a concluding sentence.

Study the following three paragraphs. Notice the different positions for the topic sentence in each. the topic sentences are Underlined.

Model 2: Position of topic sentences

Hurricanes

Topic Sentence Hurricanes, which are also called cyclones, exert tremendous power. These violent storms re often a hundred miles in diameter, and their winds can reach velocities of seventy-five miles per hour or more. Furthermore, the strong winds and heavy rainfall that accompany them can completely destroy a small town in a couple of hours. The energy that is released by a hurricane in one day exceeds the total energy consumed by humankind throughout the world in one year.

Famous School "Failures"

Topic Sentence Albert Einstein, one of the world's geniuses, failed his university entrance examinations on his first attempt. William Faulkner, one of America's noted writers, never finished college because he could not pass his English courses. Sir Winston Churchill, who is considered one of the masters of English language, had to have special tutoring in English during elementary school. These few examples show that failure in school does not always predict failure in life.

Synonyms

Topic Sentence Synonyms, words that have the same basic meaning, do not always have the same emotional meaning. For example, the words "stingy" and "frugal" both mean "careful with money." However, to call a person stingy is an insult, while the word frugal has a much more positive connotation. Similarly, a person wants to be slender but not skinny, and aggressive, but not pushy. Therefore, you should be careful in choosing words because many so-called synonyms are not really synonymous at all.

Topic Sentence
(conclusion)

The Concluding Sentence

A concluding sentence is not absolutely necessary, but it is very often helpful to the reader because it signals the end of the paragraph and because it reminds him/her of your important points.

A concluding sentence serves three purposes:

1. It signals the end of the Paragraph. (Use an end-of-paragraph signal such as "In conclusion," "In summary," "Finally," etc.)
 2. It summarizes the main points of the paragraph.
 3. It gives a final comment on your topic and leaves the reader with the most important ideas to think about.
-

The examples below demonstrates two different types of concluding sentences. The first one paraphrases the topic sentence; i.e., the concluding sentence repeats the main idea of the topic sentence in different words. The second example summarizes the two main points of the paragraph, which were not specifically stated in the topic sentence.

Model 3: Concluding sentences

Synonyms

Synonyms, words that have the same basic meaning, do not always have the same emotional meaning. For example, the words "stingy" and "frugal" both mean "careful with money." However, to call a person stingy is an insult, while the word frugal has a much more positive connotation. Similarly, a person wants to be slender but not skinny, and aggressive, but not pushy. Therefore, you should be careful in choosing words because many so-called synonyms are not really synonymous at all.

Gold

Gold, a precious metal, is prized for two important characteristics. First of all, gold has a lustrous beauty that is resistant to corrosion. Therefore, it is suitable for jewelry, coins, and ornamental purposes. Gold never needs to be polished and will remain beautiful forever. For example, a Macedonian coin remains as untarnished today as the day it was minted twenty-three centuries ago. Another important characteristics of gold is its usefulness to industry and science. For many years, it has been used in hundreds of industrial applications. The most recent use of gold is in astronauts' suits. Astronauts wear gold-plated heat shields for protection outside the spaceship. In conclusion, gold is treasured not only for its beauty, but also for its utility.

Review: What Is a Paragraph?

These are the important points you should have learned from this section:

1. A good topic sentence:
 - a. is a complete sentence with a subject, a verb, and generally a complement.
 - b. states both the topic and the controlling idea of the paragraph.
 - c. is neither too general nor too specific. It states the main idea clearly, but it does not give the specific details.
 2. A good concluding sentence:
 - a. signals the end of the paragraph.
 - b. summarizes the important points briefly.
-

Part B: Strategies for the Reading Comprehension Questions

In this part of the test you will be given reading passages, and you will be asked two types of questions about the reading passages:

1. **Reading Comprehension** questions ask you to answer questions about the information given in the reading passages, including main idea questions, directly answered detail questions, and implied detail questions.
2. **Vocabulary** questions ask you to identify the meanings of vocabulary words in the reading passages. To answer these questions, you may have to know the meanings of the words. You can also identify the meanings of some of the words by understanding the context surrounding the words, by using structural clues to identify the meanings of the words, or by breaking down the unknown words into known word parts in order to identify them.

GENERAL STRATEGIES

1. **Be familiar with the directions.** The directions on every test are the same, so it is not necessary to spend time reading the directions carefully when you take the test. You should be completely familiar with the directions before the day of the test.
2. **Do not spend too much time reading the passage!** You do not have time to read each reading passage in depth, and it is quite possible to answer the questions correctly without first reading the passages in depth. You do not need to understand every detail in each passage to answer the questions correctly. It is therefore a waste of time to read the passage with the intent of understanding every single detail before you try to answer the questions.
3. **Do not worry if a reading passage is on a topic that you are unfamiliar with.** All of the information that you need to answer the questions is included in the passages. You do not need any background knowledge to answer the questions.
4. **Find the section of the passage that deals with each question.** The question-type tells you exactly where to look in the passage to find correct answers.
 - For *main idea questions*, look at the first line of each paragraph.
 - For *directly and indirectly answered detail questions*, choose a key word in the question, and skim for that key word (or a related idea) in order in the passage.
 - For *vocabulary questions*, the question will tell you where the word is located in the passage.
 - For *overall review questions*, the answers are found anywhere in the passage.
5. **Carefully read the part of the passage that contains the answer.** The answer will probably be in the same sentence (or one sentence before or after) the key word or idea.
6. **Choose the best answer to each question from the four answer choices listed in your test booklet.** You can choose the best answer according to what is given in the appropriate section of the passage, eliminate definitely wrong answers, and mark your best guess on the answer sheet.

Part C: Eight Keys to Vocabulary Building

1. Read as much as you can

By reading as many related texts (books, journals, reports, etc.) as you can, you will encounter new words and technical terms. You can guess the meanings of many of these words by their context - that is, you will get a clue to the meaning from the words that surround the new word. If you are still not sure, you can look up the word in an appropriate dictionary to check if you were right.

2. Use a dictionary

Buy a good comprehensive dictionary, preferably a university-level dictionary along with a dictionary of scientific and technical terms. The dictionary should be all in English, not a bilingual one. A good dictionary should include the following information about a word:

- its pronunciation
- its part of speech (noun, adjective, verb)
- a clear, simple definition
- an example of the word used in a sentence or phrase (if necessary)
- its origin (roots, prefix)

You can also use a pocket dictionary if you travel back and forth to classes.

3. Learn roots, prefixes, and suffixes

Roots and prefixes from Latin and Greek make up many English words. It has been estimated that more than half of all English words come from Latin and Greek. Prefixes are added to the beginning of a root and suffixes are added to the end to modify the meaning of words. Learning these will help you increase your vocabulary.

4. Learn from listening

Listening to good programs on the radio and television as well as to people who speak English well is another way of improving your vocabulary. Since you cannot always ask the speaker to tell you what a particular word means, write down the words and look them up later.

5. Use a dictionary of synonyms and antonyms

Synonyms are words that have almost the same meaning; antonyms are words that have almost the opposite meaning. Knowing the synonyms and antonyms of a word will expand your vocabulary. Some dictionaries of synonyms and antonyms explain each synonym and how it differs in meaning for other synonyms. Since no two words have the exact same meaning, this is very useful for you.

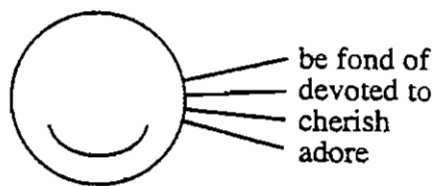
6. Make your own word list

Get a notebook for your vocabulary study and use it to create your own word list. Whenever you read and come across a word you don't know, write it down in your notebook together with the sentence in which

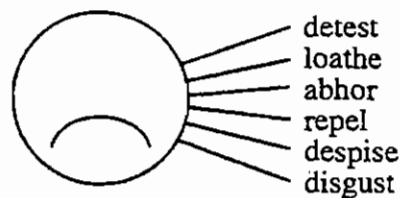
you found it. Try to work out the meaning of the word from its context. Then look the word up in a dictionary and write the definition in your notebook. Also, write down any other information such as the root of the word, and see how it is connected to the meaning. Lastly, write your own sentence using the word. Writing will help you remember the word and its meaning. Try to add a new word to your list every day.

7. Create your own theme groups

Words are easier to remember and learn when you group words with similar meanings under a theme. For example,



Then you can make another theme with the opposite.



8. Use your new words

Using your new words whether it be in speaking or writing is an important step in learning them.



SECTION 2

M.Sc. EXAM's QUESTIONS

1) MSc Entrance Examinations (1374)

Select the correct choice.

1- کلمه CNC مخفف است.

- 1) computer numerical control
- 2) comprehensive nature of carbon
- 3) computing number for cutting
- 4) commanding navigational commons

Read the following passage and choose the correct choice.

A visitor to a guarded government area must pass through an electronic eye. The eye is a large magnetized gateway. Bells ring and lights flash if metal passes in front of the eye. Before entering, visitors must remove such things as car keys, coins and jewels.

In this way anyone carrying a weapon or a camera is stopped from entering the area. Such security measures are needed to keep national secrets intact.

What an amazing invention! Yet twenty-three hundred years ago, a Moon Gate was built at the royal palace in Peking, China. It was made of loadstone, a magnetic iron ore. Its purpose, too, was to stop anyone with a hidden metal object.

2- The purpose of this electronic eye is to

- 1) see everything
- 2) detect metallic objects
- 3) draw metal out of pockets
- 4) take a photograph of all who pass through it

3- Visitors remove car keys and coins because

- 1) keys and coins are made of metal
- 2) the coins may be stolen
- 3) the visitors don't want to lose them
- 4) the visitors don't need them in the area

4- Bells ring and lights flash if

- 1) an enemy agent enters
- 2) anyone tells a national secret
- 3) anyone enters after the area is closed
- 4) anything metallic passes in front of the eye

5- The electronic eye is like the Moon Gate because it

- | | |
|---------------------------|-------------------|
| 1) Both 2 and 4 | 2) has loadstones |
| 3) has magnetic qualities | 4) rings bells |

6- The Moon Gate in China was made of

- 1) electric batteries
- 2) gold
- 3) loadstone
- 4) a piece of the moon that fell to earth

7- Both the Moon Gate and the electronic eye have been used to

- 1) detect hidden metal objects
- 2) detect hidden camera
- 3) keep national secrets safe
- 4) keep all visitors out

8- Implied but not stated: Since the time of the Moon Gate in China, people have

- 1) used a Moon Gate
- 2) constantly used electronic eyes
- 3) not needed detecting devices
- 4) substituted new materials for old in detecting metal objects

2) MSc Entrance Examinations (1375)

Select the correct choice.

1- مایع لزج را اصطلاحاً می گویند.

- 1) Boiling fluid
- 2) Irresistible
- 3) Solid material
- 4) Viscous fluid

Read the following passages and choose the correct choice.

Manned space-crafts travel at the speed of almost five miles a second. But a spacecraft is slow compared with the fastest traveller in the known universe ... light. Scientists calculate that light travels 186000 miles in a second!

Swift though it is, light takes time to cross interstellar space. Light from Sirius, a neighbouring star, travels for nine years to reach us. Even sunlight takes more than eight minutes to reach earth.

Because of the time light takes to travel the distances of space, it is possible to "see" an event long after it has happened. In A.D. 1054, Chinese astronomers recorded the appearance of an object that lit up the night sky. They were seeing a supernova ... an exploding star. Yet scientists today calculate that the star exploded more than four thousand years ago. Like the Chinese observers, we too may "see" happenings vast distances away and long before own our time.

2- Space-crafts can travel at the speed of about

- | | |
|-------------------------|---------------------------|
| 1) five miles a minute | 2) five miles a second |
| 3) four thousand r.p.m. | 4) 186,000 miles a second |

3- The fastest traveller in the known universe is

- | | |
|----------|-------------------|
| 1) earth | 2) Halley's comet |
| 3) light | 4) the sun |

4- The time taken for light from sirius to reach us is calculated as

- | | |
|----------------|----------------|
| 1) eight years | 2) seven years |
| 3) six years | 4) nine years |

5- Sunlight's journey to earth takes minutes.

- | | |
|--------------------|--------------------|
| 1) eighteen | 2) less than eight |
| 3) more than eight | 4) more than nine |

6- A supernova is

- | | |
|---------------------------------|------------------------------------|
| 1) an exploding star | 2) any bright light |
| 3) a vast interstellar distance | 4) a period of four thousand years |

7- The bright light of A.D. 1054 was observed by

- | | |
|------------------------|------------------------|
| 1) Chinese astronomers | 2) Chinese astrologers |
| 3) German astronomers | 4) Indian astrologers |

8- The time of the event shown by this light has been calculated as

- | | |
|---------------------------------|--------------------------------------|
| 1) 1000 B.C. | 2) 54 B.C. |
| 3) about two thousand years ago | 4) more than four thousand years ago |

9- Implied but not stated: The astronomers of A.D. 1054

- 1) wrote in Latin
- 2) left poor records of the supernova
- 3) left records complete enough for scientists to use today
- 4) recorded the light and calculated the time of the event it indicated

Solar energy is rapidly becoming a logical alternative source of heat as the cost and unavailability of conventional fuels becomes a major problem in industrial countries. Getting energy from the sun is not a new idea. Most people have had the experience of getting a sunburn on a cloudy day, much to their surprise; the energy is always there. Technology has now brought the cost of harnessing the sun closer to being economically competitive. Finally, the fact that solar heating and solar cooling are very attractive environmentally provides another reason to switch from conventional fuels.

10- In the passage, "harnessing the sun" is another way of saying

- | | |
|-----------------------------|-------------------------|
| 1) "controlling the sun" | 2) "riding the sun" |
| 3) "using the sun's energy" | 4) "tying down the sun" |

11- According to the passage, energy from the sun is evidenced physically by

- | | |
|------------------------------------|---------------------------------|
| 1) seeing a shadow | 2) getting sunburned |
| 3) sunshine passing through clouds | 4) seeing the sun behind clouds |

12- Solar heat is becoming a logical source of energy because conventional fuels

- | | |
|-----------------------------------|-----------------------------|
| 1) are attractive environmentally | 2) are becoming unavailable |
| 3) are too expensive | 4) are not expensive enough |

13- In the sentence, "solar energy is rapidly becoming an alternative source of heat", the word "alternative" means

- | | |
|--|--|
| 1) the same as something else | 2) the opposite of something else |
| 3) an option to be used in place of something else | 4) an option similar to something else |

3) MSc Entrance Examinations (1376)

Part A

Directions. In this part of the test, each item consists of an incomplete sentence. Below the sentence are four choices, marked (1), (2), (3), and (4). You should find the one choice which best completes the sentence. Mark your choice on the answer sheet.

1- The generators at the dam water power into electricity.

- | | |
|------------|----------------|
| 1) convert | 2) evaporate |
| 3) divert | 4) orchestrate |

2- The news broadcast the rumor that a circus was coming to town.

- | | |
|--------------|------------|
| 1) contended | 2) devised |
| 3) revised | 4) revived |

Part B: Reading Comprehension

Directions. Each selection is followed by questions about the meaning of the material. You are to choose the one best answer to each question from the four choices given.

The accuracy of scientific observations and calculations is always at the mercy of the scientist's timekeeping methods. For this reason, scientists are interested in devices that give promise of more precise timekeeping.

In their search for precision, scientists have turned to atomic clocks that depend on various vibrating atoms or molecules to supply their "ticking". This is possible because each kind of atom or molecule has its own characteristic rate of vibration. The nitrogen atom in ammonia, for example, vibrates or "ticks" 24 billion times a second.

One such atomic clock is so accurate that it will probably lose no more than a second in 3000 years. It will be great importance in fields such as astronomical observation and long-range navigation. The heart of this Atomichron a cesium atom that vibrates 9.2 billion times a second when heated to the temperature of boiling water.

An atomic clock that operates with an ammonia molecule may be used to check the accuracy of predictions based on Einstein's relativity theories, according to which a clock in motion and a clock at rest should keep time differently. Placed in an orbiting satellite moving at a speed of 18,000 miles an hour, the clock could broadcast its time readings to a ground station, where they would be compared with the readings on a similar model. Whatever differences develop would be checked against the differences predicted.

3- The selection says that the accuracy of scientific observation depends on

- | | |
|------------------------|---------------------------|
| 1) timekeeping methods | 2) methods of measurement |
| 3) basic assumptions | 4) earlier experiments |

4- Scientists expect that the atomic clocks will be

- | | |
|------------------------|-----------------|
| 1) indestructible | 2) more durable |
| 3) absolutely accurate | 4) more precise |

5- From the selection, we may assume that temperature changes

- 1) affect only ammonia molecules
- 2) may affect the vibration rate of atoms
- 3) affect the speed at which atoms travel
- 4) do not affect atoms in any way

6- Identical atomic clocks may be used to check

- 1) the effects of outer space on an atomic clock
- 2) the actual speed of an orbiting satellite
- 3) all of Einstein's theories
- 4) the accuracy of predictions based on theories of relativity

7- What we understand from the passage is that

- 1) precise timekeeping is essential in science
- 2) scientists expect to disprove Einstein's relativity theories
- 3) atomic clocks will be important in space flight
- 4) the rate of vibration of an atom never varies

8- A "BEND" under pressure means

- | | |
|-------------|---------------|
| 1) buckled | 2) compressed |
| 3) deformed | 4) elongate |

9- If light can not pass through an object, it is said that the object is

- | | |
|------------|----------|
| 1) opaque | 2) dull |
| 3) blurred | 4) optic |

Companies in the network industry are following the same vectors they did before the turn of the century. Connectivity, though far easier, is still not a given. Products come with built-in network capabilities. Where and how it connects is another matter. A proliferation of standards-software and hardware has the industry bollixed. Every time a technology curve flattens, and people become at ease with the status quo, innovation from another company changes everything.

10- The above passage is about

- 1) bollixed industry
- 2) computers and companies
- 3) development of networks
- 4) progress of networks

11- The title that best describes the main idea of this passage is

- | | |
|----------------------|-----------------------|
| 1) Network Industry | 2) Network Technology |
| 3) Network Evolution | 4) Network and People |

If a magnetic field is set up across a nonconducting tube and a conducting fluid flows through the tube, an induced voltage is produced across the flow which may be measured if electrodes are embedded in the tube walls. The voltage is a linear function of the volume rate passing through the tube. Either an alternating or a direct current field may be used, with a corresponding signal generated at the electrodes. A disadvantage of the method is the small signal received and the large amount of amplification needed. The device has been used to measure the flow in blood vessels.

12- According to the text, signals are generated

- | | |
|----------------------|---------------------------|
| 1) in direct current | 2) by alternative current |
| 3) in the electrodes | 4) by all three cases |

13- Induction voltage is measured by

- | | |
|---------------------------|-----------------------------|
| 1) conducting fluid | 2) electrodes on tube walls |
| 3) fluid flow in the tube | 4) magnetic field |

To try and prevent this corrosion, the metal is coated with cement wash, bitumen and paint. Cement wash is a mixture of cement powder and fresh water. It is used in fresh water tanks and double bottom tanks. Bitumen is used in bilges and peak tanks. It is also used on metal decks before they are sheathed with wood. However, the principal protective coating is paint. There are many types of paint available nowadays in a wide variety of colours and it is no longer necessary for the Boatswain to mix his own. Paints are stowed in the paint locker, which is usually situated under the forecastle head.

14- Cement coating is suitable for protection of

- | | |
|-----------------------|------------------|
| 1) inside-water tanks | 2) metal decks |
| 3) peat tanks | 4) paint lockers |

15- Corrosion protection under the wood surface is by

- | | |
|-----------------|---------------------|
| 1) paint | 2) cement materials |
| 3) mixed paints | 4) bitumen |

The Prandtl number ν/α has been found to be the parameter which relates the relative thicknesses of the hydrodynamic and thermal boundary layers. The kinematic viscosity of a fluid conveys information about the rate at which momentum may diffuse through the fluid because of molecular motion. The thermal diffusivity tells us the same thing in regard to the diffusion of heat in the fluid. Thus the ratio of these two quantities should express the relative magnitudes of diffusion momentum and heat in the fluid. But these diffusion rates are precisely the quantities that determine how thick the boundary layers will be for a given external flow field; large diffusivities mean that the viscous or temperature influence is felt farther out in the flow field. The Prandtl number is thus the connecting link between the velocity field and the temperature field.

16- A "large momentum diffusivity" is used when

- | | |
|-------------------------------------|-------------------------------------|
| 1) temperature influence is greater | 2) temperature influence is smaller |
| 3) viscous influence is greater | 4) viscous influence is smaller |

17- Prandtl number shows

- 1) how thick thermal boundary layer is
- 2) the ratio of momentum to thermal boundary layer
- 3) the ratio of thermal to momentum boundary layer
- 4) how thick hydrodynamic and thermal boundary layers are

Not all the energy expressed by the solar constant reaches the surface of the earth, because of strong absorption by carbon dioxide and water vapor in the atmosphere. The solar radiation incident on the earth's surface is also dependent on the atmospheric content of dust and other pollutants. The maximum solar energy reaches the surface of the earth when the rays are directly incident on the surface since (1) a larger view area is presented to the incoming solar flux and (2) the solar rays travel a smaller distance through the atmosphere so that there is less absorption than there would be for an incident angle tilted from the normal.

18- Solar flux is reduced because of

- | | |
|--------------------------------|-------------------------------|
| 1) pollutants absorption | 2) CO ₂ absorption |
| 3) H ₂ O absorption | 4) all three parameters |

19- Solar energy becomes maximum when

- 1) a larger view factor is present
- 2) there is less pollutants in the atmosphere
- 3) solar rays travel smaller distances
- 4) all three cases are correct

The theory of turbomachines is based on the relationships between jets and vanes. The mechanics of transfer of work and energy from fluid jets to moving vanes is studied as an application of the momentum principles. When a free jet impinges onto a smooth vane that is curved, the jet is deflected, its momentum is changed, and a force is exerted on the vane, the jet is assumed to flow onto the vane in a tangential direction, without shock; and furthermore, the frictional resistance between jet and vane is neglected. The velocity is assumed to be uniform throughout the jet upstream and downstream from the vane. Since the jet is open to the air, it has the same pressure at each end of the vane. Neglecting the small change in elevation between ends, if any, application of Bernoulli's equation shows that the magnitude of the velocity is unchanged for *fixed* vanes.

20- Force is produced because

- | | |
|-------------------------------|-------------------------------------|
| 1) momentum is changed | 2) jet is deflected |
| 3) jet impinges onto the vane | 4) all three parameters are correct |

21- The vane is curved to

- | | |
|--|--|
| 1) make the velocity uniform in the downstream | 2) make the velocity uniform in the upstream |
| 3) deflect the jet | 4) reduce the friction |

22- The jet flows tangent to the vane to

- | | |
|---------------------------------|---------------------------------|
| 1) assume uniform flow velocity | 2) have the pressure at the end |
| 3) reduce the shock | 4) neglect changes of elevation |

4) MSc Entrance Examinations (1377)
Reading Comprehension

Each selection is followed by questions about the meaning of the material. You are to choose the one best answer to each question from the four choices given.

The arms and hands of our prehistoric ancestors were probably not very different from the human arm and hand today. The upper and lower joints of the arm, elbow and wrist, were probably very similar, and the basic structure of the hand with its five fingers was also the same. But according to some scientists, there has been an important change—a change in the way we hold things. Many hundreds of thousands of years ago, our

ancestors could hold things in only one way. This is called the power grip. The power grip is used, for example, to hold a hammer or a piece of wood. With this grip, you hold the object in the palm of the hand with four fingers on one side and the thumb on the other.

Later, the human hand developed a second grip, which we call the precision grip. This grip is used, for example, in holding a pen or a paintbrush. With this grip you have much greater control over what you are holding. The object is usually held by the soft parts of the fingertips (below the fingernails) of the first three fingers -- the thumb, the forefinger and the middle finger. With this grip, the little finger and the ring finger do nothing.

The development of the precision grip was important. It made it possible for humans to become tool makers, and so humans became the first and only animals to create and use technology.

1- Millions of years ago, prehistoric people could hold things

- 1) in one way
- 2) in two ways
- 3) in more than two ways
- 4) in the same way as we do

2- How has the human hand changed?

- 1) The wrist moves differently.
- 2) There are now five fingers.
- 3) It can grip differently.
- 4) It has become more powerful.

3- When you use the precision grip you hold something with

- | | |
|---------------------|-----------------|
| 1) all five fingers | 2) four fingers |
| 3) three fingers | 4) your thumb |

Modern mass-production methods lower the cost of making goods, and thus give us better values. At the same time, American ingenuity and science are constantly at work improving the quality of products. In this way, better quality products at good values are continually being brought to the people of all income groups.

As an example of how this works, when facial tissues were first put on the market in 1924, they were made in limited quantities and sold at 65 cents per box of 200. People liked these facial tissues immediately and began asking for them when they went into different stores. Because there was such a demand for the product, manufacturers began making tissues in larger and larger quantities. Because the manufacturers were making tissues in greater quantities, their production costs were lowered, so that the cost of tissues went down. In the meanwhile, the quality of facial tissues was constantly improving, because more manufacturers went into the business of making tissues, and each manufacturer strove to make his product better than his competitors'. Today, instead of costing 65 cents, a box of 200 facial tissues costs around one-third of that price, and they are both softer and stronger.

When people are free to compete -- when they are free to make more things and make them better -- everyone benefits.

4- In regard to the production of goods in greater quantities, the author states that the

- 1) price of the goods should rise
- 2) price of the goods should drop
- 3) quality and price should both rise
- 4) quality should rise and the price should drop

5- Producing facial tissues in large quantities resulted in

- 1) decreased production costs
- 2) increased production costs
- 3) a monopoly of the industry by one manufacturer
- 4) a poorer product

6- When manufacturers of facial tissues discovered how to produce tissues for less money, they reduced the

- 1) profits they anticipated from sales
- 2) price a consumer must pay for their product
- 3) quality so as to earn even greater profits
- 4) standards of the entire industry

7- Improved quality of facial tissues resulted from

- 1) a decrease in price
- 2) mass-production methods
- 3) popular demand for a better product
- 4) competition among manufacturers

8- From this article, we can see that lower prices and improved quality occur

- 1) always at the same time
- 2) as a result of the effect of one on the other
- 3) independently of each other
- 4) through the kindness of manufacturers

9- Iron will if left exposed to a damp atmosphere.

- | | |
|------------|--------------|
| 1) brittle | 2) boil away |
| 3) mould | 4) tarnish |

10- Lubrication oil fills up the depressions and covers the which cover the surface of parts of machinery.

- | | |
|----------------|---------------|
| 1) air strips | 2) cliffs |
| 3) projections | 4) oil fields |

11- "Yield point" is near to

- | | |
|------------------|--------------------|
| 1) elastic limit | 2) fracture point |
| 3) plastic limit | 4) ultimate stress |

12- Shaft of a steam turbine may be coupled to a

- | | |
|-----------------------|-----------------|
| 1) combustion chamber | 2) compressor |
| 3) nuclear reactor | 4) steam engine |

13- "Angular Acceleration" is equal to

- 1) acceleration of an angle
- 2) derivative of angular velocity with respect to time
- 3) derivative of velocity with respect to time
- 4) linear acceleration of a body about a point

14- An force is defined to be a very large force over a very small time interval.

- | | |
|-------------|---------------------------|
| 1) external | 2) indirect impulsive |
| 3) impact | 4) oblique central impact |

15- Thermodynamics is the branch of physics concerned with

- 1) control of heat
- 2) heat as a form of energy
- 3) heat exchange
- 4) heat and fluid transfer

Today, refrigeration is vital to health, keeping foods fresh longer and slowing down the bacterial action that causes decay. Perishable foods are sent all over the country and are kept in storage. Storage temperatures vary from below freezing in a place like the fish-depot in Bandar Abbas to about 10°C in places like the fruit-storage warehouses of Tehran.

16- What is this passage about?

- | | |
|---------------------------------|------------------------------|
| 1) Advantages of Refrigeration | 2) Delivery of Refrigeration |
| 3) Delivery of Perishable Foods | 4) Problem of Defrostration |

Most materials used in engineering are elastic. A material which has the property of elasticity will return to its original size and shape when the forces producing strain are removed. However, if these forces go beyond a certain limit, called the elastic limit, an elastic material will not regain its original dimensions. If we take a bar of uniform cross-sectional area of an elastic material like mild steel, and apply gradually increasing tensile forces to it, it will extend. Here, strain is proportional to stress. The value of this constant is different for each elastic material. If we exceed the elastic limit, then strain is no longer proportional to stress and there is permanent deformation.

17- The purpose of this passage is to

- 1) develop measurements to evaluate processes
- 2) discuss a mild steel property
- 3) discuss the materials
- 4) discuss proportionality of stress and strain

18- Which is true?

- 1) All engineering materials are elastic.
- 2) Elastic materials cannot be in a state of stress.
- 3) Mild steel is an inelastic material.
- 4) Mild steel is an elastic material.

19- Permanent deformation of materials is caused by

- 1) elastic limit of materials
- 2) force needed after elastic limit
- 3) more compression force
- 4) more tensile force

5) MSc Entrance Examinations (1378)

Select the correct choice.

1. When one measures the difference between the expected position and the actual position of a mechanical system, one measures its

- 1) accuracy
- 2) naturalness
- 3) precision
- 4) viscosity

2. The term "anodize" used technically means ".....".

- 1) conducting
- 2) hardening
- 3) heat treatment
- 4) electrochemical treatment

- (1) Every body continues at rest or in a state of uniform motion unless a disturbing force acts upon it.
- (2) A body, acted upon by a force, experiences an acceleration in the direction of the force and proportional in amount to it, and inversely proportional to the mass of the body.
- (3) To every action of a force there is an equal and opposite reaction.

3. The above three laws form

- 1) Hamilton's Minimal Path
- 2) Newton's Laws of Motion
- 3) Kepler's Basic Ideas of Celestial Mechanics
- 4) Bernard Lamy's Theorem of Three Forces

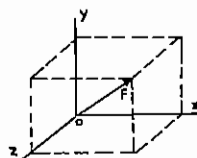
It is a technical concept meaning the product of a force (F) times the displacement (δs) of the body or particle acted on, in the direction of the force or $\delta W = F \cos \theta \cdot \delta s$, where θ is the angle between the direction of F and of the displacement.

4. The above passage is said to be the simplest definition for ".....".

- 1) work
- 2) Rolling Contact
- 3) Friction
- 4) Force

5. In the figure below, where X, Y, and Z are specified axes, F shows

- 1) the magnitude of an acting force
- 2) velocity motion
- 3) that a vector is portrayed graphically
- 4) acceleration motion



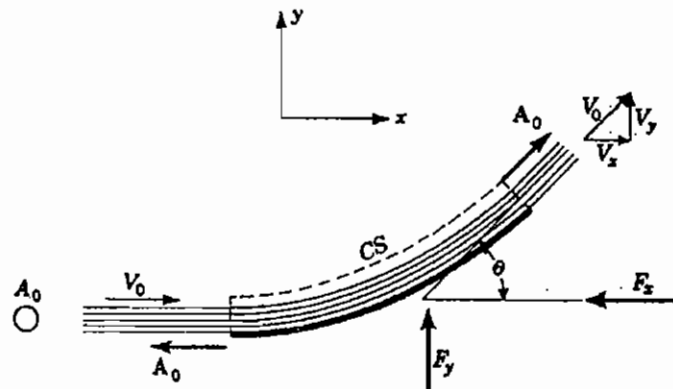
6. "The velocity of v of A relative to S is the vector v , which is the rate of change of position vector r with respect to time t ."

This is written in differential calculus terminology as

- | | |
|---------------------------|-----------------------------|
| 1) $a = xi + yj + zk$ | 2) $\alpha = \frac{dv}{dt}$ |
| 3) $v = r = xi + yj + zk$ | 4) $v = \frac{dr}{dt}$ |

7. The figure below shows the

- 1) solar radiation which arrives at the surface
- 2) free jet impinging on smooth, fixed vane
- 3) wave length at which the maximum spectrum occurs
- 4) black body temperature for the solar radiation



Read the passages and answer the following questions:

With liquid lubrication of sliding guide surfaces, errors for the motion accuracy because of oil film floating can not be avoided, and in most cases, wear from metal also can not be avoided because of the boundary lubrication range.

In case of sliding contact, where this friction is large, the largest part of the large motion energy causes wear, so that energy is consumed.

On the other hand, rolling contact has less friction energy, so that there is little wear, of the rolling surfaces, and high accuracy can be maintained for a long time. In addition, only small amounts of lubricating oil are required, and as grease lubrication is sufficient in most cases, lubrication design and management are very easy.

8. The main topic of the passage is about

- | | |
|-------------------|-------------------|
| 1) Management | 2) Positioning |
| 3) Rolling Guides | 4) Linear Systems |

9. According to the text, the duration of life in metals depends on the

- 1) amount of energy exerted
- 2) amount of rust on the metal's surface
- 3) contact between two non-adjacent objects
- 4) viscosity of the lubrication fluid

10. The less the wear of rolling surfaces is, the

- 1) more the lubrication range will be
- 2) more energy is produced in two discs
- 3) less energy is exerted by the rolling guides
- 4) less grease lubrication is needed

11. Physics is a science dealing with the nature and behavior of the world around us. In physics, natural phenomena, are interpreted in terms of certain concepts or quantities. These concepts are mass, force, energy, and electrical charge, to name a few.

Physics is a science that interprets natural phenomena according to

- 1) natural observation of physicist
- 2) certain concepts or quantities
- 3) experiments done in a laboratory
- 4) speculation of early Greek thinkers

12. A magnet is a substance which attracts certain other substances. Substances which are attracted by a magnet are known as magnetic substances. Iron, cobalt and Nickel are magnetic substances. They are attracted by magnets and can themselves be magnetized.

Iron, cobalt and nickel are

- 1) neither attracted by magnets nor can be magnetized
- 2) replaced by magnets but cannot be magnetized
- 3) attracted by magnets and can also be magnetized
- 4) attracted by magnets but cannot be magnetized

13. A solid has a definite shape and volume. It usually resists compression to a great extent, and may have any number of free surfaces exposed to the air. A liquid has no shape of its own but takes the shape of its container.

A solid is a kind of matter which might have any number of

- | | |
|----------------------|---------------------|
| 1) free surfaces | 2) different shapes |
| 3) different volumes | 4) corrosion ratios |

14. Some would say that mathematics is an art that lets them express their feelings about order and form, others would emphasize the mathematical theories upon which the science of our universe is based, still others would talk about mathematics as logical thinking.

Different people have different beliefs about mathematics because it

- 1) is understood differently by mathematicians
- 2) has different implications for all scientists
- 3) is a language that has different uses for them
- 4) has an extensive control over universal sciences

15. Substances that allow electrons to pass freely through them are call conductors .They include such metals as silver and copper. We give the name of insulator to a substance that does not allow electrons to move through it freely.

Copper and silver are conductors because they

- | | |
|-----------------------------------|--|
| 1) have a deficiency of electrons | 2) have electrons deposited on them |
| 3) are used by electrons | 4) allow electrons to pass in and out freely |

6) MSc Entrance Examinations (1379)

Select the correct choice.

1. Ray is related to

- | | |
|----------|-----------|
| 1) light | 2) books |
| 3) paper | 4) metals |

2. Humidity is related to

- | | |
|----------|-----------|
| 1) sand | 2) water |
| 3) glass | 4) metals |

3. Thermometer is a device for measuring

- | | |
|--------------|----------------|
| 1) length | 2) velocity |
| 3) viscosity | 4) temperature |

4. Biomechanics is the study of

- | | |
|---------------|------------------------------|
| 1) geology | 2) sociology |
| 3) psychology | 4) mechanics of human motion |

5. A measure of the difference between expected position and actual position of a mechanical system means

- | | |
|-------------|-----------|
| 1) rate | 2) range |
| 3) accuracy | 4) weight |

6. A mechanical engineer deals with

- | | |
|------------------------|----------------------------|
| 1) fossils | 2) movie production |
| 3) criminal activities | 4) materials and processes |

7. Welding is used to

- | | |
|------------------------|--------------------------|
| 1) join parts | 2) machine products |
| 3) bend metallic parts | 4) test quality of parts |

8. A furnace the temperature of a body left inside it.

- | | |
|--------------------|-------------------------|
| 1) increases | 2) decreases |
| 3) does not change | 4) may or my not change |

9. The convection process will body heat if the air around body is warmer than the skin.

- | | |
|--------------|-------------|
| 1) decrease | 2) increase |
| 3) dissipate | 4) absorb |

10. The term "machining"

- 1) refers to all forming processes
- 2) does not cover material removal methods
- 3) is a broad term used to produce plastic products
- 4) describes abrasive, traditional and non-traditional methods

11. Machining refers to removing the material by

- | | |
|---|--|
| 1) drilling, sawing, boring, moulding, etc | 2) turning, milling, grinding, boring, etc |
| 3) planning, shaping, turning, casting, etc | 4) threading, boring, grinding, forging, etc |

12. The process of is called manufacturing.

- 1) shaping raw materials
- 2) producing discrete products
- 3) converting raw materials into products
- 4) conventional and non-conventional machining

13. Lubrication oil fills up the and covers the which covers the surface of parts of machinery.

- 1) projections, air
- 2) air, depressions
- 3) depressions, projections
- 4) projections, depressions

14. Continuity equation is expressing the conservation of

- | | |
|-----------|-------------|
| 1) mass | 2) heat |
| 3) energy | 4) momentum |

15. are examples of machine tools that can be found in a machine shop.

- 1) Milling machine, sewing machine, lathe, etc
- 2) Lathe, milling machine, mechanical saw, shaper, etc
- 3) A large hydraulic press, a lathe, a sewing machine, a miller, etc
- 4) Lathe, milling machine, broaching machine, plastic injection machine, etc

7) MSc Entrance Examinations (1381)

Read the passage carefully and choose the best answer.

Concurrent engineering, also called simultaneous engineering, is a design approach in which design and product manufacturing are merged in an intimate way. All the process of optimization in the world cannot make up in cost savings for careless design decision in material selection, selection of fasteners, and ease of assembly. In recent years, much of the success of overseas competitors has been attributed to a rapid product development cycle through the use of concurrent engineering.

A non-routine aggregate planning relating the system and the environment includes establishing the firm's philosophy; recognizing and evaluating the system's environment; clarifying management strategies, planning new plant installation, allocating overall resources, etc. The information flow process in the manufacturing system proceeds with the following steps: aggregate production management, process planning, production scheduling, and production implementation. The flow of materials, which is an indispensable activity in manufacturing, is accompanied by the flow of costs and the raw materials are converted into products with increased value. However, this activity might be disturbed for many reasons including machine breakdown, absenteeism, tool failure, and malfunction of the machines.

Manufacturing may produce discrete products or continuous products. Nails, gears, steel balls, beverage cans, engine blocks, plastic sheets, hoses, and pipes are examples of manufactured products. In a highly competitive environment, production methods must be sufficiently "flexible" to respond to changing market demands, production rates, and production quantities.

Function and appearance are crucial concerns of product design. After completing the background research on the idea, the preliminary designs are produced. The product designer may have developed a set of sketches prior to this point. Sketches, blueprints, and drawings constitute the principal means of communication in manufacturing. Among the things the consumer considers when buying a product are its convenience, durability, and maintenance.

Manufacturing engineers through cooperation with industrial engineers plan floor activities such as plant layout, machine arrangement, material-handling equipment, time-and-motion study, production methodologies, production planning and scheduling, and maintenance. Some of these activities are carried out under the name plant engineering, and some are interchangeably performed by both manufacturing and industrial engineers. Manufacturing engineers, in cooperation with industrial engineers, also are responsible for evaluating new technologies, their applications, and the way they can be implemented.

1. A flexible production method is used in order to respond to changing

- | | |
|----------------------|------------------------|
| 1) nails and gears | 2) production rates |
| 3) discrete products | 4) continuous products |

2. According to the passage, the most crucial concern of product design is

- | | |
|-----------------------------------|---------------------------------------|
| 1) function of design | 2) background research |
| 2) communication in manufacturing | 4) blueprints, sketches, and drawings |

3. The process which proceeds with production implementation step is called the

- | | |
|-----------------------------------|------------------------|
| 1) flow of costs | 2) flow of materials |
| 3) communication in manufacturing | 4) flow of information |

4. Tool failure may disturb

- | | |
|--------------------------|----------------------------|
| 1) the raw materials | 2) machine breakdown |
| 3) the flow of materials | 4) malfunction of machines |

5. Concurrent engineering is a joint activity between

- | | |
|--|-------------------------------------|
| 1) design and manufacturing | 2) discrete and continuous products |
| 3) material selection and ease of assembly | 4) research and design |

6. Success in competition may be obtained by using

- | | |
|------------------------|-----------------------------|
| 1) a design approach | 2) overseas competitors |
| 3) product development | 4) simultaneous engineering |

7. According to the passage, the application of new technologies should be evaluated by

- | | |
|--------------------------------------|---|
| 1) a plant engineer | 2) a manufacturing engineer |
| 3) manufacturing and plant engineers | 4) manufacturing and industrial engineers |

8) MSc Entrance Examinations (1382)

Read the following passage and choose the correct choice.

Machinery is a group of parts arranged to perform a useful function. Normally some of the parts are capable of motion; others are stationary and provide a frame for the moving parts. The terms machine and machinery are so closely related as to be almost synonymous; however, machinery has a plural implication, suggesting more than one machine. Common examples of machinery include automobiles, clothes washers, and airplanes; machinery differs greatly in number of parts and complexity.

Some machinery simply provides a mechanical advantage for human effort. Other machinery performs functions that no human being can do for long-sustained periods. A jackscrew does nothing until a person pulls on a lever; then they are able to move objects many times their weight. Conversely, an internal combustion engine can run unattended for hours, requiring only the press of a button to start it.

The need for machinery usually stems from a desire to do a job at less cost. Evolution of machinery for a certain function may be gradual or rapid. If only small quantities of a product are needed, it is likely that machinery used in making the product will not change rapidly or possess the highest degree of automation. On the other hand, machinery used in making automobiles has evolved into some of the most complex automatic machines in existence.

1. The first paragraph provides

- 1) a few examples of machines
- 2) a definition of the term
- 3) the mechanical advantage of machinery
- 4) a comparison of machine with machinery

2. According to the passage, human beings usually used to do

- 1) jobs which changed rapidly
- 2) things in a way which was less costly
- 3) many jobs at the same time
- 4) things as precisely as possible

3. Clothes washers are an example of

- 1) machines
- 2) machinery
- 3) complex machines (machines with moving and motionless parts)
- 4) machinery with mainly stationary parts

4. The machinery for making a product may not change in a short time because of

- 1) the cost of making the machinery
- 2) the size of the product
- 3) the quantity of the product
- 4) the degree of automation

5. The word "evolved" (underlined) in the third paragraph is closest in meaning to

- | | |
|--------------|--------------|
| 1) happened | 2) evolved |
| 3) increased | 4) developed |

9) MSc Entrance Examinations (1383)

Choose the appropriate word that best completes the sentence.

1. Mechanical devices such as windmills, water wheels, and steam or gasoline engines, various forms of energy and change them into another form called mechanical energy.

- | | |
|-------------|--------------|
| 1) harness | 2) preserve |
| 3) energize | 4) dissipate |

2. In a car engine, air mixed with gasoline is taken into a confined space, first it is and then combustion process occurs.

- | | |
|--------------|---------------|
| 1) ignited | 2) expanded |
| 3) exhausted | 4) compressed |

3. The rotation of the camshaft is due to

- 1) rise of the piston
- 2) rotation of the crankshaft
- 3) closure of the exhaust valve
- 4) movement of the crankshaft

4. To develop a rotary movement in a car engine, the piston is connected to a

- | | |
|-------------------|-------------------|
| 1) crankcase | 2) crankshaft |
| 3) cylinder block | 4) connecting rod |

5. Most small internal combustion engines have four cylinders, which fire in a definite and regular

- | | |
|--------------|--------------|
| 1) sequence | 2) symptom |
| 3) clearance | 4) frequency |

10) MSc Entrance Examinations (1384)

Read the following passages, and then answer the questions.

Passage I:

The energy of water utilized for hydropower generation may be kinetic or potential. The kinetic energy of water is its energy in motion and is a function of mass and velocity, while the potential energy is a function of the difference in level of water between the two points, called the *head*. In either case continuous availability of water is a basic necessity. For this purpose water collected in natural lakes and reservoirs at high altitudes may be utilised or water may be artificially stored by constructing dams across the flowing streams. The ideal site is one in which a good system of natural lakes, with substantial catchment area, exists at a high altitude. Rainfall is the primary source of water and depends upon such factors as temperature, humidity, cloudiness, wind direction and velocity, etc. The utility of rainfall for power generation further depends upon several complex factors which include its intensity and time distribution, topography of land and its drainage characteristics, etc.

Cheap and abundant power is essential to the modern world in coming years. The rapid increase in industry and living standard of the people advance the pressure on conventional sources of power, i.e., coal, oil, and hydro. The resources of these fuels are becoming depleted in many countries, and thus there is a tendency to seek alternative sources of energy. Hydroelectric stations produce cheap power, but need a thermal backing to increase the firm capacity.

In a nuclear power station instead of a furnace, there is a nuclear reactor, in which heat is generated by splitting atoms of a radioactive material under suitable conditions. This splitting or nuclear fission of materials like uranium (U), plutonium (Pu) has opened up a new source of power of great importance. The heat produced

due to fission of uranium and plutonium is used to heat water to generate steam which is used for running turbogenerators.

1. The first paragraph implies that water power is utilised to

- 1) produce kinetic energy
- 2) provide potential energy
- 3) bring about hydroelectric
- 4) collect water in a reservoir

2. According to the text, the word "head" refers to

- 1) the top or highest part of something
- 2) the more important or prominent end of something
- 3) the pressure produced by an amount of water steam in a confined space
- 4) the difference in the height of water between the two points

3. The most necessary factor in the generation of hydroelectric power is the

- 1) continuous renewal of water sources by nature
- 2) building of artificial dams
- 3) constructing of substantial catchment areas
- 4) invention of powerful generators

4. Which of the following factors does not affect the rainfall for electric power generation?

- 1) Temperature
- 2) Distillation
- 3) Humidity
- 4) Cloudiness

5. In the second paragraph, the word "abundant" means

- | | |
|-----------------|-----------------|
| 1) inexpensive | 2) plentiful |
| 3) high voltage | 4) intermittent |

6. The second paragraph implies that

- 1) living standards of people are increasing rapidly
- 2) coal, oil, and water are conventional power resources
- 3) modern world, in coming years, needs a great amount of electric power
- 4) the people should not be wasteful of their natural resources

7. To run turbogenerators, to produce electricity, the

- 1) generation of steam is necessary
- 2) building of a furnace is essential
- 3) atoms are destroyed to provide radioactive radiation
- 4) steam is condensed into soft water

8. In the second paragraph, the word "depleted" means

- | | |
|----------------------------------|----------------------|
| 1) explored and mined | 2) reduced greatly |
| 3) dispatched to other countries | 4) exploited rapidly |

9. Nuclear fission of uranium or plutonium produces

- 1) a cheap source of power
- 2) heat to change water into steam
- 3) smog which causes air pollution
- 4) no radioactive radiation at all

10. An appropriate title for this passage would be

- 1) Conventional Power Plants
- 2) Nuclear Power Plants
- 3) Power Stations
- 4) Generators and Plants

Passage II:

Casting processes are first categorized by the manner in which the materials are forced into the mold cavity. The two basic forces are gravity and pressure systems.

The second classification of casting processes is by the mold material. The mold can be made of sand and is destroyed when the object is removed. This is called **sand casting** and is normally used only for metals. However, there are many variations of the sand processes. Each variation has a certain advantage and disadvantage relating to accuracy, cost, and the types of metals that can be cast. Other types of materials such as plaster and ceramics are also used for the destructible molds similar to those used for sand casting. Molds can also be made of permanent materials so that the mold may be reused.

Plasters molds used for making small statues and figurines in ceramics and porcelain are examples of reusable molds using the force of gravity. Complex pressure-fed permanent molds made of metal are commonly used for making such items as automobile carburetors, plastic toys, or lead pipes. The molding material is forced into a preshaped permanent mold under pressure.

Casting processes are also categorized by the material being cast. A foundry, for example, is a shop or factory where metal castings are made. An identical molding process used to cast plastics would occur in a casting shop and not a foundry. Shops specializing in casting iron objects would be called **iron foundries**, where a shop utilizing similar processes for making specific items from plastics might be called a **plastics speciality shop**. Almost any material that can be liquified may be shaped by the casting process. Also included are materials which, although not liquid, are given some degree of fluidity, such as granular plastic materials that can be later bonded or solidified by heat or chemical action. Materials commonly shaped by casting processes include plastics, glass, ceramics and porcelain, metals, and even paper products.

Molds can also be characterized by whether they are reused or whether they are destroyed during removal of the cast object. Both types of processes are extensively used in industry. When the mold is regarded as permanent, it is often referred to as a **die**. When the mold is a unit that is destroyed in the removal of the object, it is referred to as a **mold**. Permanent molds are generally made from durable materials such as iron or steel. Permanent molds for plastics may be made of softer, more easily worked metals such as aluminum or brass.

Molding processes are also used in manufacturing material shapes for the construction industry. Concrete, for example, is a material that must be formed by a mold. Concrete molds may be constructed on the site for such things as basements, foundations, supports, sidewalls, and other similar items. However, permanent

molds are used in casting various standardized concrete objects such as precast concrete construction beams, precast concrete bricks and paving blocks, steps, large-diameter drain pipes, and other similar items used in the construction industry.

To illustrate the extensive use of casting processes, iron and steel cast products alone make up the sixth largest industrial grouping. This does not include the casting of nonferrous metals nor does it include casting of other materials such as glass, ceramics, plastics, or concrete. The casting of iron and steel products by various sand-casting processes form the largest portion of all castings produced. This is closely followed by casting nonferrous metals by die-casting and sand-casting processes and the casting or molding of plastics.

11. The writer believes that

- 1) casting plastics would take place in a foundry
- 2) only those materials that can be liquefied may be shaped by casting processes
- 3) the shops which are specialized in casting iron objects would be called iron foundries
- 4) granular plastic materials cannot be later bonded by heat or chemical action

12. In paragraph five, line 2, "Both types of processes" refers to

- 1) two permanent molds used in industry
- 2) durable materials such as iron and steel used as permanent molds
- 3) whether molds are reused or destroyed during removal of the cast object
- 4) more easily worked metals such as aluminum and brass

13. To construct large-diameter concrete drain pipes molds are used.

- | | |
|-----------------|-----------------|
| 1) sand casting | 2) destructible |
| 3) die casting | 4) permanent |

14. The sixth largest industry grouping includes cast products such as

- | | |
|------------------------|--------------------------|
| 1) nonferrous metals | 2) ceramics and plastics |
| 3) concrete and cement | 4) iron and steel |

15. The materials shaped by casting processes

- | | |
|---|--|
| 1) are those that can be liquefied | 2) ought to be granular |
| 3) should be bonded with other substances | 4) must always be subjected to high temperatures |

11) MSc Entrance Examinations (1385)

Passage I:

Read the following three passages and answer the questions.

1) Year ago, all refrigerators had to be defrosted manually. You would turn the refrigerator off, open the doors(2), and allow any frost build-up to melt. When the frost had completely melted away, you would turn the refrigerator back on. This was often time-consuming, and the foods inside the refrigerator had to be removed. Moreover, there were quite often times when people forgot to switch them back on, so all the foods decayed!

2) Today, almost all refrigerators are self-defrosting, meaning that although frost continues to accumulate inside the refrigerator in a regular fashion, it will melt automatically once the defrost system turns on. This provides a great advantage over the past as the contents of a refrigerator do not have to be emptied. Besides, the system can always stay on, so there is no risk corrupting the food by simply forgetting to turn the refrigerator back on! A further advantage of such systems is that they can decrease frost by reducing the degree of moisture inside the container. Thus, if the air inside the refrigerator is dried, chances of frost condensation can be minimized. This will be discussed below.

3) The self-defrosting system has three functional components: defrost timer, defrost heater and thermostat. The defrost timer is like a clock. It continually advances 24 hours a day. Depending on such factors as time of day, room temperature, and the make of a refrigerator, the timer can turn off the cooling system of the refrigerator, and turn on the defrost heater instead every 6 to 8 hours.

4) The defrost heater is similar to the burners on an electric stove. It is located just beneath the cooling coils, which are concealed behind a panel in the freezer compartment. The heater gets hot, and as it is close to the cooling coils, any ice or frost build-up melts. As the frost and ice melt, the resulting water drips into a trough. The trough is connected to a tube that drains the water into a shallow pan at the bottom of the refrigerator. The water is then evaporated by a fan that blows warm air from the compressor motor over the pan and out the front of the refrigerator.

5) The process ends after either the amount of time specified on the timer or when the defrost thermostat near the cooling coils senses that the heat near the coils has reached a specific temperature.

1. How did the first defrost systems work?

- 1) There was no defrost system.
- 2) By opening the doors of the refrigerator.
- 3) They worked with the assistance of a man.
- 4) By melting the frost inside the refrigerator.

2. Which is true about self-defrosting system?

- 1) They continually build up frost.
- 2) They convert frost into moisture.
- 3) They don't require disconnection from the mains.
- 4) They do not corrupt the food by emptying the refrigerator.

3. What factors may trigger a defrost timer?

- 1) Time, temperature, the refrigerator brand etc.
- 2) Daytime, room temperature and the manufacturing process etc.
- 3) Daytime, room temperature, and the model of the defroster etc.
- 4) Refrigerator temperature, daytime, and the shape of the refrigerator etc.

4. Which is true about paragraph 4?

- | | |
|---|--|
| 1) The cooling coils build up melts. | 2) There is an electric stove inside the heater. |
| 3) The cooling coils and the stove are aligned. | 4) Defrost heaters and electric stove are alike. |

5. Which is true about this passage?

- 1) The passage finishes what it discusses.
- 2) The passage discusses all types of defrosters.
- 3) There is one point that the passage leaves unexplained.
- 4) The passage discusses both manual and automatic defrosters.

Passage II:**Corrosion**

1) Corrosion is deterioration of useful properties in a material due to reactions with its environment. Weakening of steel due to oxidation of the iron atoms is a well-known example of electrochemical corrosion. This type of damage usually affects metallic materials, and typically produces oxide(s) and/or salt (s) of the original metal. Corrosion also includes dissolution of ceramic materials and can refer to discoloration and weakening of polymers by the sun's ultraviolet light.

2) Most structural alloys corrode merely from exposure to moisture in the air, but the process can be strongly affected by exposure to acids, bases, salts and organic chemicals. It can be concentrated locally to form a pit or crack, or it can extend across a wide area to produce general deterioration; efforts to reduce corrosion sometimes merely redirect the damage into less visible, less predictable forms.

3) Most ceramic materials are almost entirely immune to corrosion. The strong ionic and/or covalent bonds that hold them together leave very little free chemical energy in the structure; they can be thought of as already corroded. When corrosion does occur, it is almost always a simple dissolution of the material or chemical reaction, rather than an electrochemical process. A common example of corrosion protection in ceramics is the lime added to soda-lime glass to reduce its solubility in water; though it is not nearly as soluble as pure sodium silicate, normal glass does form sub-microscopic flaws when exposed to moisture. Due to its brittleness, such flaws cause a dramatic reduction in the strength of a glass object during its first few hours at room temperature.

4) The degradation of polymeric materials is due to a wide array of complex and often poorly-understood physicochemical processes. These are strikingly different from the other processes discussed here, and so the term "corrosion" is only applied to them in a loose sense of the word. Because of their large molecular weight, very little entropy can be gained by mixing a given mass of polymer with another substance, making them generally quite difficult to dissolve. While dissolution is a problem in some polymer applications, it is relatively simple to design against. A more common and related problem is swelling, where small molecules infiltrate the structure, reducing strength and stiffness and causing a volume change. Conversely, many polymers (notably flexible vinyl) are intentionally swelled with plasticizers, which can be leached out of the structure, causing brittleness or other undesirable changes. The most common form of degradation, however, is a decrease in polymer chain length. Mechanisms which break polymer chains are familiar to biologists because of their effect on DNA: ionizing radiation (most commonly ultraviolet light), free radicals, and oxidizers such as oxygen, ozone, and chlorine. Additives can slow this process very effectively, and can be as simple as a UV-absorbing pigment (i.e., titanium dioxide or carbon black). Plastic shopping bags often do not include these additives so that they break down more easily as litter.

6. From paragraph 1, we can conclude that corrosion

- | | |
|---------------------------------------|---|
| 1) is useful | 2) happens because of oxidation |
| 3) always happens in metallic matters | 4) includes reactions with the surroundings |

7. Paragraph 2 discusses the of corrosion.

- 1) types 2) extension 3) causes and places 4) structure and nature

8. Which is true about paragraph 3?

- 1) Glass is more prone to corrosion than ceramic.
 2) Some ceramics are already corroded!
 3) Corrosion in ceramic is dissolution.
 4) Ceramic is immune to corrosion.

9. From paragraph 4 we can understand that:

- 1) Polymers swell for better stiffness.
 2) Polymers are easier to dissolve than ceramics.
 3) Polymers chain length is a sign of resistance to corrosion.
 4) Ceramics and polymeric materials react similarly to corrosion.

10. What does the underlined phrase "this process" in paragraph 5 refer to?

- 1) Ionizing 2) Leaching 3) Degradation 4) Oxidizing

Passage III:

Air Conditioners

An air conditioner uses a material called a "working fluid" to transfer heat from inside of a room to the great outdoors. The working fluid is a material which transforms easily from a gas to a liquid and vice versa over a wide range of temperatures and pressures. This working fluid moves through the air conditioner's three main components, the compressor, the condenser, and the evaporator in a continuous cycle.

The working fluid enters the evaporator inside the room as a low-pressure liquid at approximately outside air temperature. The evaporator is typically a snake-like pipe. The fluid immediately begins to evaporate and expands into a gas. In doing so, it uses its thermal energy to separate its molecules from one another and it becomes very cold. Heat flows from the room to this cold gas. The working fluid leaves the evaporator as a low-pressure gas a little below room temperature and heads off toward the compressor. It enters the compressor as a low-pressure gas roughly at room temperature. The compressor squeezes the molecules of that gas closer together, increasing the gas's density and pressure. Since squeezing a gas involves physical work, the compressor transfers energy to the working fluid and that fluid becomes hotter. The working fluid leaves the compressor as a high-pressure gas well above outside air temperature. The working fluid enters the condenser on the outside, which is typically a snake-like pipe. Since the fluid is hotter than the surrounding air, heat flows out of the fluid and into the air. The fluid then begins to condense into a liquid and it gives up additional thermal energy as it condenses. This additional thermal energy also flows as heat into the outside air. The working fluid leaves the condenser as a high-pressure liquid at roughly outside air temperature. It then flows through a narrowing in the pipe into the evaporator. When the fluid goes through the narrowing in the pipe, its pressure drops and it enters the evaporator as a low-pressure liquid. The cycle repeats. Overall, heat is extracted from the room and delivered to the outside air. The compressor consumes electric energy during this process, which turn into thermal energy in the outside air. The maximum coefficient of such an air conditioner is $E_{\max} = T_{\text{room}} / (T_{\text{outside}} - T_{\text{room}})$ Refrigerators and heat pumps work in the same way.

11. Which of the following is NOT true about a working fluid?

- 1) Its initial temperature is roughly that of outside.
 2) It is converted into different states of matter.
 3) It should be pumped into the compressor.
 4) It gives off heat while under pressure.

12. As the coolant enters the pipe, it

- 1) liquefies 2) increases in size 3) condenses 4) extracts the vapor

13. What causes a rise in the heat in the coolant?

- 1) Energy transfer 2) Thermal effect 3) Evaporation 4) Flowing

14. All of the following are true except:

- 1) Piping is not designed in a straight way.
 2) During this cycle some exhaust air is produced.
 3) Principles applied in this system are applied to other machines, too .
 4) Pressure on working fluid is maintained by changing the shape of the pipes.

15. The coolant circulates in the system due to

- 1) heat 2) condenser's force 3) gravity change 4) shape of the pipes

12) MSC Entrance Examination (1386)

PART A: Fill in the blanks with the best word or phrase.

1 . A pump which operates on the principle of the venturi tube is

- 1) venturi pump 2) reciprocating pump 3) jet pump 4) double acting pump

2 . A state which a substance takes as it changes from liquid to gas

- 1) boil 2) condense 3) freeze 4) vapor

Part B: Reading comprehension

Directions: Read carefully the following three passages and choose the best choice.

PASSAGE I:

The basic components of an internal-combustion engine are the engine block, cylinder head, cylinders, pistons, valves, crankshaft, and camshaft. The lower part of the engine, called the engine block, houses the cylinders, pistons, and crankshaft. The component of other engine systems bolt or attach to the engine block. The block is manufactured with internal passageways for lubricants and coolants. Engine blocks are made of cast iron or aluminium alloy and formed with a set of round cylinders.

The upper part of the engine is the cylinder head. Bolted to the top of the block, it seals the tops of the cylinders. Pistons compress air fuel against the cylinder head prior to ignition. The top of the piston forms the floor of the combustion chamber, and a rod connects its bottom to the crankshaft. Lubricated bearings enable both ends of the connecting rod to pivot, transferring the piston's vertical motion into the crankshaft's rotational force, or torque. The piston's motion rotates the crankshaft at speeds ranging from about 600 to thousands of revolutions per minute (rpm), depending on how much fuel is delivered to the cylinders.

Fuel vapor enters and exhaust gases leave the combustion chamber through openings in the cylinder head controlled by valves. The typical engine valve is a metal shaft with a disk at one end fitted to block the opening. The other end of the shaft is mechanically linked to a camshaft, a round rod with odd-shaped lobes located inside the engine block or in the cylinder head. Inlet valves open to allow fuel to enter the combustion chambers. Outlet valves open to let exhaust gases out.

3 . Which statement is true about paragraph 1?

- 1) It lists the major components of car engine in general.
- 2) It discusses the manufacturing process of the engine block.
- 3) It introduces the components of the lower part of an engine.
- 4) Engine components such as valves, pistons, and cylinders are cast iron.

4 . Which connector is a rotating one?

- | | | | |
|---------|----------|--------|---------|
| 1) Bolt | 2) Pivot | 3) Rod | 4) Seal |
|---------|----------|--------|---------|

5 . What does the underline 'its' in paragraph 2 refer to?

- | | |
|------------------------------------|----------------------------------|
| 1) Rod | 2) Piston |
| 3) Floor of the combustion chamber | 4) Top of the combustion chamber |

6 . Which word in paragraph 3 is synonymous with 'passage'?

- | | | | |
|----------|------------|------------|----------|
| 1) Enter | 2) Exhaust | 3) Opening | 4) Valve |
|----------|------------|------------|----------|

PASSAGE II:

General-heating systems, in which one centrally located heating unit is used to warm several rooms or an entire house, were developed in the 1800s. a type of centralized heating, using hot water, was used to limited extent in Britain about 1816, but the first successful central system, introduced in 1835, used warm air. This system subsequently came into extensive use in the United States. Steam heating was developed about 1850.

Present-day central-heating systems provide heat from a central furnace for a single building or group of buildings. In large systems, steam or hot water is usually employed to distribute the heat. Most dwellings are provided with central heating, as are office buildings, hotels, and even groups of buildings, such as those in shopping malls. The term district heating is applied to systems in which a large number of buildings are supplied with steam from central boiler rooms operated by a public utility.

7 . The term 'dwelling' in paragraph 2 is closest in meaning to

- | | | | |
|-------------|----------|-----------|---------|
| 1) building | 2) hotel | 3) office | 4) home |
|-------------|----------|-----------|---------|

PASSAGE III:

Fuel cells are electrochemical devices that combine hydrogen and oxygen in an electrolyte fluid (a solution of ions that conducts an electric current), creating an electrical charge across a membrane. The reaction produces a steady flow of electricity. The principle behind fuel cell was first discovered in 1829, nearly 50 years before the first internal-combustion engine. Unlike most power plants, which use mechanically spinning generators, fuel cells have no moving parts.

The fuel - cell concept first attracted interest in the late 19th century, when a fuel cell, three times as efficient as American inventor Thomas Edison's best electric generator, was demonstrated. But the technology was expensive, and interest in the concept withered. Advances in materials and electronics were necessary to make fuel cells useful and practical. In the 1960s fuel cells captured the interest of the U.S. space program, which developed small, efficient fuel cells for use in spacecraft. These orbiting fuel cells were expensive, but by the 1980s—in the wake of the 1970s oil shortages – they had again attracted the interest of government researchers and investors.

Fuel cells are roughly twice as efficient as conventional engines in converting fuels to mechanical or electrical power. They require little maintenance, are nearly silent, and emit only water vapor. Along with the solar cell, some experts believe the fuel cell could allow human civilization in the 21st century to step beyond the age of fire (combustion), which has provided the bulk of the world's energy for more than ten millennia.

Unlike most power plants, where larger facilities were long associated with lower costs per unit of energy, fuel cells are nearly as economical on a small scale as on a large one. Researchers are particularly interested in the proton – exchange membrane (PEM) fuelcell, a design that is now being studied as a potential motor vehicle engine, small–scale electricity generator, and even as a power source for laptop computers. Ballard, a Canadian company that has invested heavily in PEM fuel cells, believes the cells can eventually produce electricity at less than \$100 per kilowatt, undercutting modern coal–fired power plants by a factor of five or more.

The first generation of fuel cells will likely obtain hydrogen from natural gas, which can be separated into hydrogen and carbon dioxide when it is heated. But the long – term goal is to use hydrogen directly. Hydrogen is the most abundant element in the universe and is found on earth as a component of water. Hydrogen can be produced from water through electrolysis, which involves splitting water molecules into oxygen and hydrogen by running an electric current between submerged electrodes.

Electricity generated from renewable resources can produce hydrogen through electrolysis, but the process is expensive using currently available technologies. Chemists recently developed a solar–powered “water splitter” that nearly doubles the efficiency of converting solar energy to hydrogen. But the procedure is costly, using two different semiconductors. Finding less–expensive semiconductors is one key to making the device economical. Some experts believe that the discovery of an inexpensive efficient way to electrolyze water would make hydrogen–powered fuel cells the world’s dominant energy carrier within a few years.

Until that occurs, natural gas could form a kind of bridge to a hydrogen- based energy system natural gas is more abundant than oil, and it has been less heavily exploited, raising the prospect that it will be an important energy source early in the next century. Because the system for transporting natural gas can also be used to carry hydrogen, a separate system for hydrogen could be built up gradually. One approach would be to mix hydrogen with natural gas and carry the fuels in the same pipelines, shifting later to new pipelines that are designed to carry pure hydrogen.

8 . What does the underlined phrase in paragraph 1 mean?

- | | |
|---|--|
| 1) The mechanical parts in fuel cells do not move | 2) The parts in a fuel cell are static |
| 3) Fuel cells produce static electricity | 4) Fuel cells produce chemical electricity |

9 . What are the important motives in developing the fuel cell technology?

- | | |
|---------------------------------|------------------------------|
| 1) Efficiency and oil shortage | 2) Price and interest |
| 3) Space program and government | 4) Researchers and inventors |

10 . Which concept is a little contradictory between paragraphs 2 and 3?

- | | | | |
|-------------|-------------|--------------|--------------|
| 1) Emission | 2) Expenses | 3) Fuel cell | 4) Generator |
|-------------|-------------|--------------|--------------|

11 . What does the word ‘millennia’ in paragraph 3 mean?

- | | | | |
|-----------------------|---------------------|----------------------|-----------------------|
| 1) centuries of years | 2) decades of years | 3) millions of years | 4) thousands of years |
|-----------------------|---------------------|----------------------|-----------------------|

12 . We can infer from paragraph 4 that

- 1) energy output increases with the size of the fuel cell
- 2) fuel cells have an inverse relationship with energy output
- 3) power plants have a direct relationship with energy output
- 4) the larger the fuel cell, the smaller the amount of energy

13 . What matters most for the first generation fuel cells?

- 1) Water 2) Natural gas 3) Hydrogen 4) Electrolysis

14 . What does the word 'process' in paragraph 6 refer to?

- 1) Renewing resources 2) Hydrogen production
3) Electricity generation 4) Electrolysis

15 . Which statement is true about paragraph 7?

- 1) There is an urgent need for radical changes in the transportation system.
2) There is no urgent need for radical changes in the transportation system.
3) The present pipeline networks can be readily used for hydrogen delivery.
4) The present approach is to use the existing pipeline networks to transfer hydrogen.

13) MSC Entrance Examination (1387)

Directions: Read the following three passages and choose the best choice.

PASSAGE I:

The cylinder of an internal-combustion engine is closed at one end by a plate called the head and open at the other end to permit free oscillation of the connecting rod, which joins the piston to the crankshaft. The cylinder head contains the spark plugs on spark-ignition (gasoline) engines and usually the fuel nozzle on compression-ignition (diesel) engines; on some engines the valves that control the admission of fresh fuel and the escape of burned fuel are also located in the head.

On most engines the cylinders are smoothly finished holes in the main structural component of the engine that is known as the block, which is generally made of cast iron or aluminum. On some engines the cylinders are lined with sleeves (liners) that can be replaced when they become worn. Aluminum blocks employ centrifugally cast iron liners that are placed in the mold when the aluminum is being cast; these liners are not replaceable, but they can be rebored.

Pistons are usually equipped with piston rings. These are circular metal rings that fit into grooves in the piston walls and assure a snug fit of the piston inside the cylinder. They help provide a seal to prevent leakage of compressed gases around the piston and to prevent lubricating oil from entering the combustion chamber.

1. What is the subject of the passage?

- | | |
|-----------------------------------|---|
| 1) Parts of the cylinder | 2) The cylinder and piston |
| 3) The internal-combustion engine | 4) Devices controlling the flow of fuel |

2. According to the passage, what links the piston to the crankshaft is called

- | | | | |
|--------|----------|---------|----------|
| 1) rod | 2) plate | 3) head | 4) block |
|--------|----------|---------|----------|

3. The word "they" in line 10 refers to

- | | | | |
|------------|--------------|-----------|--------------|
| 1) engines | 2) cast iron | 3) liners | 4) cylinders |
|------------|--------------|-----------|--------------|

4. What does paragraph 3 mainly discuss?

- | | |
|--------------------------------------|---|
| 1) Structure of pistons | 2) Function of piston rings |
| 3) Physical features of piston rings | 4) The way the piston is fitted into the cylinder |

5. The word "replaced" in line 10 is closest in meaning to

- | | | | |
|--------------|---------------|----------------|---------------|
| 1) precluded | 2) dislocated | 03) superseded | 4) transmuted |
|--------------|---------------|----------------|---------------|

PASSAGE II:

What, then, is a solid? Any material, fluid or solid, can support normal forces. These are forces directed perpendicular, or normal, to a material plane across which they act. The force per unit of area of that plane is called the normal stress. Water at the base of a pond, air in an automobile tire, the stones of a Roman arch, rocks at the base of a mountain, the skin of a pressurized airplane cabin, a stretched rubber band, and the bones of a runner all support force in that way (some only when the force is compressive).

A material is called solid rather than fluid if it can also support a substantial shearing force over the time scale of some natural process or technological application of interest. Shearing forces are directed parallel, rather than perpendicular to the material surface on which they act; the force per unit of area is called shear stress. For example, consider a vertical metal rod that is fixed to a support at its upper end and has a weight attached at its lower end. If one considers a horizontal surface through the material of the rod, it will be evident that the rod supports normal stress. But it also supports shear stress, and this becomes evident when one considers the forces carried across a plane that is neither horizontal nor vertical through the rod. Thus, while water and air provide no long-term support of shear stress, granite, steel, and rubber normally do so and are therefore called solids. Materials with tightly bound atoms or molecules, such as the crystals formed below melting temperature by most substances or simple compounds and the amorphous structures formed in glass and many polymer substances at sufficiently low temperature, are usually considered solids.

- 6. The word "perpendicular" in Line 2 is closest in meaning to**
- 1) curved 2) vertical 3) straight 4) upright
- 7. Which one of the following best represents the rhetorical purpose of the passage?**
- 1) Definition 2) Comparison 3) Classification 4) Exemplification
- 8. The word "its" in line 10 refers to -----.**
- 1) rod 2) end 3) weight 4) support
- 9. All of the following are true about water EXCEPT that it -----.**
- 1) can support normal forces
 2) cannot provide long-term support of shear stress
 3) can in no way provide support to a substantial shearing force for a long time
 4) cannot support forces directed normal to a material plane across which It acts
- 10. The word "tightly" in line 14 is closest in meaning to**
- 1) firmly 2) ardently 3) precisely 4) intricately
- 11. What is the author's attitude towards the subject of the passage?**
- 1) Favorable 2) Skeptical 3) Objective 4) Disparaging

PASSAGE III:

A fundamental law that has been observed to hold for all natural phenomena requires the conservation of energy-i.e., that the total energy does not change in all the many changes that occur in nature. The conservation of energy is not a description of any process going on in nature, but rather it is a statement that the quantity called energy remains constant regardless of when it is evaluated or what processes-possibly including transformations of energy from one form into another-go on between successive evaluations.

The law of conservation of energy is applied not only to nature 'as a whole but to closed or isolated systems within nature as well. Thus, if the boundaries of a system can be defined in such a way that no energy is either added to or removed from the system, then energy must be conserved within that system regardless of the-details of the processes going on inside the system boundaries. A corollary of. this closed-system statement is that whenever the energy of a system as determined in two successive evaluations is not the same, the difference is a measure of the quantity of energy that has been either added to or removed from the system in the time interval elapsing between the two evaluations.

Energy can exist in many forms within a system and may be converted from one form to another within the constraint of the conservation law. These different forms include gravitational, kinetic, thermal, elastic, electrical, chemical, radiant, nuclear, and mass energy. It is the universal applicability of the concept of energy, as well as the completeness of the law of its conservation within different forms, that makes ~ so attractive and useful.

12. What is the best title for the passage?

- | | |
|-----------------------------------|--------------------------------------|
| 1) Transformations of Energy | 2) Concept of Energy Conservation |
| 3) Quantity and Quality of Energy | 4) Importance of Energy Conservation |

13. "The word "Corollary" in line U is closest in meaning to

- | | | | |
|-----------|-----------|---------------|---------------|
| 1) impact | 2) upshot | 3) proportion | 4) concession |
|-----------|-----------|---------------|---------------|

14. The word "it" in line 21 refers to

- | | |
|--------------------------|--------------------------------|
| 1) energy conservation | 2) universal applicability |
| 3) the concept of energy | 4) the completeness of the law |

15. Where does in the passage does the write mention certain forms energy can take?

- | | | | |
|--------------|---------------|----------------|----------------|
| 1) Lines 1-3 | 2) Lines.8-12 | 3) Lines 13-16 | 4) Lines 18-19 |
|--------------|---------------|----------------|----------------|

14) MSC Entrance Examination (1388)

Directions: Read the following three passage and choose the best choice.

Passage I

Many mechanical engineering companies, especially those in industrialized nations, have begun to incorporate computer-aided engineering (CAE) programs into their existing design and analysis processes, including 2D and 3D computer-aided design. This method has many benefits, including easier and more exhaustive visualization of products, the ability to create virtual assemblies of parts, and the ease of use in designing mating interfaces and tolerances.

Other CAE programs commonly used by mechanical engineers include product lifecycle management tools and analysis tools used to perform complex simulations.

Analysis tools maybe used to predict product response to expected loads, including fatigue life and manufacturability. These tools include finite element analysis, computational fluid dynamics., and computer-aided manufacturing.

Using CAE programs, a mechanical design team can quickly and cheaply iterate the design process to develop a product that better meets cost, performance, and other constraints. No physical prototype need be created-until the design nears completion, allowing hundreds or thousands of designs to be evaluated, instead of a relative few. In addition, CAE analysis programs can model complicated physical phenomena which cannot be solved by hand, such as viscoelasticity, complex contact between mating parts, or non-Newtonian flows.

1. What is the main idea of this passage?

- 1) Mechanical engineering has merged with computer engineering to improve the design process.
- 2) Mechanical engineering involves the application of principles of CAE for manufacturing and maintenance of mechanical systems.
- 3) Mechanical engineers are required to understand and be able to apply basic concepts from computer engineering.
- 4) The incorporation of CAE programs into mechanical engineering design processes helps mechanical engineers gain practical problem -solving experience.

2. The word "their" in line 2 refers to

- 1) programs
- 2) nations
- 3) companies
- 4) processes

3. The passage states that mechanical engineers use analysis tools

- 1) to explore possible designs
- 2) to manufacture mechanical products
- 3) to prevent fatigue failure
- 4) to evaluate product reaction to known loads

4. It can be inferred from the passage that

- 1) mechanical design teams evaluate a small number of designs before they develop a product
- 2) computer - aided engineering programs are only used to solve problems which cannot be solved by hand
- 3) the design team analyze physical samples of a product so as to decide on the final version of the product design
- 4) computer - aided engineering programs are well used in mechanical engineering companies in developed countries

5. Where in the passage are advantages of CAE programs mentioned?

- 1) Lines 4-6 2) Lines 10-11 3) Lines 7-9 4) Lines 17-18

Passage II

Structural analysis is the branch of mechanical engineering devoted to examining why and how objects fail. Structural failures occur in two general modes: static failure, and fatigue failure. Static structural failure occurs when, upon being loaded, the object being analyzed either breaks or is deformed plastically, depending on the criterion for failure. Fatigue failure occurs when an object fails after a number of repeated loading and unloading cycles. Fatigue failure occurs because of imperfections in the object: a microscopic crack on the surface of the object, for instance, will grow slightly with each cycle until the crack is large enough to cause ultimate failure.

Failure is not simply defined as when a part breaks, however; it is defined as when a part does not operate as intended. Some systems, such as the perforated top sections of some plastic bags, are designed to break. If these systems do not break, failure analysis might be employed to determine the cause.

Structural analysis is often used by mechanical engineers after a failure has occurred, or when designing to prevent failure. Engineers often use online documents and books to aid them in determining the type of failure and possible causes.

6. Which of the following is NOT supported by the first paragraph?

- 1) Structural analysis is the study of why objects and systems move.
 2) Fatigue failure occurs when objects fail after several loading and unloading.
 3) Static structural failure and fatigue failure are types of structural failure.
 4) Structural analysis is concerned with structural failure in objects and systems.

7. The second paragraph states that failure is defined in terms of

- 1) how loads affect objects
 2) the poor performance of objects
 3) how different objects deform
 4) the forces that cause the failure

8. The word "imperfections" in line 6 is closest in meaning to

- 1) shifts 2) reactions 3) faults 4) contrasts

9. According to the passage, failure analysis is often used in plastic bag factories

when

- 1) the produced bags deform plastically 2) perforated sections of plastic bags break
 3) structural failure occurs repeatedly 4) the upper parts of plastic bags resist breaking

10. The word "them" in line 13 refers to

- 1) documents 2) books 3) engineers 4) causes

Passage III

Engineers use their knowledge of science, mathematics, and appropriate experience to find suitable solutions to a problem. Engineering is considered a branch of applied mathematics and science. Creating an appropriate mathematical model of a problem allows them to analyze it, and to test potential solutions. Usually multiple reasonable solutions exist, so engineers must evaluate the different design choices on their merits and choose the solution that best meets their requirements. Genrich Altshuller, after gathering statistics on a large number of patents, suggested that compromises are at the heart of "low-level" engineering designs, while at a higher level the best design is one which eliminates the core contradiction causing the problem.

Engineers typically attempt to predict how well their designs will perform to their specifications prior to full-scale production. They use, among other things; prototypes, scale models, simulations, destructive tests, nondestructive tests, and stress tests. Testing ensures that products will perform as expected. Engineers as professionals take seriously their responsibility to produce designs that will perform as expected and will not cause unintended harm to the public at large. Engineers typically include a factor of safety in their designs to reduce the risk of unexpected failure. However, the greater the safety factor, the less efficient the design may be.

11. What can be the best title for this passage?

- 1) History of engineering
- 2) Engineering and problem solving
- 3) Applications of engineering
- 4) Engineering means applied mathematics

12. According to Genrich Altshuller, at lower levels of engineering,

- 1) there are no differences between existing solutions
- 2) possible solutions should be changed so that they can be used together
- 3) more attention should be paid to the cause of a problem
- 4) attempts should be made to eliminate the basic contradiction

13. What should engineers do when there are more than one solution to a problem?

- 1) They should choose reasonable solutions.
- 2) They should consider the solution which is best for their situation.
- 3) They should eliminate those which might cause additional problems.
- 4) They should analyze them so that they all match their requirements.

14. In order to predict how their designs meet performance, engineers use all of the following EXCEPT

- 1) models of the new product
- 2) scale models
- 3) economics of operation
- 4) stress tests

15. Which of the following can be inferred from the passage?

- 1) It is usually enough for the engineer to build a technically successful product.
- 2) Engineers derive specifications for the limits within which an object or a system may be operated after full-scale production.
- 3) Requirements for marketability and productivity are considered more important than those for cost and safety.
- 4) The crucial task of the engineer is to identify and understand the constraints on a design in order to produce a successful result.

SECTION 3 SELECTED TESTS

Choose the correct choice.

- 1. Thermodynamics is the study of energy and its**
 - 1) consumption
 - 2) utilization
 - 3) application
 - 4) transformation
- 2. is the fluid property that causes shear stresses in a moving fluid.**
 - 1) Density
 - 2) Specific heat
 - 3) Viscosity
 - 4) Elasticity
- 3. The three modes of heat transfer are conduction, radiation, and**
 - 1) convection
 - 2) expansion
 - 3) separation
 - 4) contraction
- 4. When a thermodynamic system changes from one state to another, it is said to execute a**
 - 1) procedure
 - 2) method
 - 3) process
 - 4) technique
- 5. Gaps are left at the joints in a railway line. This is because of the of metals on heating.**
 - 1) contraction
 - 2) expansion
 - 3) insertion
 - 4) production
- 6. The boiling points of different substances**
 - 1) combines
 - 2) determines
 - 3) differs
 - 4) measures
- 7. When a state of equilibrium has been reached, diffusion**
 - 1) begins
 - 2) changes
 - 3) continues
 - 4) ceases
- 8. Something which is produced artificially by men is known as**
 - 1) satisfactory
 - 2) systematic
 - 3) synthetic
 - 4) superior
- 9. Heat is readily in all metals.**
 - 1) insulated
 - 2) prevented
 - 3) conducted
 - 4) absorbed
- 10. A polished surface more heat than a dull one.**
 - 1) absorbs
 - 2) encloses
 - 3) extracts
 - 4) reflects
- 11. The rate of expansion of solids, liquids, and gases**
 - 1) differs
 - 2) depends
 - 3) decreases
 - 4) destroy
- 12. When a solid is heated, it**
 - 1) contracts
 - 2) expands
 - 3) produces
 - 4) resists

13. The only mechanism by which heat can travel in vacuum is by

- 1) conduction
2) convection
3) insulation
4) radiation

14. A free body falls towards the center of the earth because it is by the force of gravity.

- 1) attracted
2) pulled
3) both (1) and (2)
4) forced

15. When coal is burned, some of the stored chemical energy is

- 1) compared
2) condensed
3) derived
4) released

16. Rain is formed by the of water on the earth's surface by means of the sun's heat.

- 1) condensation
2) evaporation
3) reflection
4) survival

17. Heat is quickly from one molecule to the next.

- 1) escaped
2) prevented
3) transferred
4) known

18. The word thermodynamics means heat power, or power from heat.

- 1) expanded
2) built
3) improved
4) developed

19. The recycling of aluminum conserves ninety-five percent of the energy needed to make a new material. Recycling means

- 1) cleaning
2) reprocessing
3) reselling
4) crushing

20. When water becomes very cold in a freezer, it

- 1) hardens
2) shortens
3) softens
4) widens

21. A fluid is defined as a substance that continuously when acted on by a shearing stress of any magnitudes.

- 1) transforms
2) deforms
3) diverts
4) deflects

22. The resultant fluid force acting on a body that is completely submerged or floating in a fluid is called the force.

- 1) external
2) buoyancy
3) impulsive
4) impact

23. is the point at which the strain increases without a corresponding increase in the load.

- 1) Proportional limit
2) Breaking point
3) Ultimate strength
4) Yield point

24. A body which is subjected to a tensile force will

- 1) contract
2) expand
3) break away
4) lengthen

Read the following passage and choose the correct choice.

In a turbo-jet aeroplane ... 25 ..., the ... 26 ... of the fuel ... 27... the air, which is forced out through the exhaust pipe and ... 28 ... the forward ... 29 It is the smoke from the exhaust pipe which can be seen behind a jet plane in the sky. A jet plane can reach much higher ... 30 ... than a normal plane.

25.

- | | |
|--------------|---------------|
| 1) body | 2) engine |
| 3) propeller | 4) compressor |

26.

- | | |
|-------------|----------------|
| 1) ejecting | 2) cooling |
| 3) burning | 4) compressing |

27.

- | | |
|----------|------------|
| 1) heats | 2) cools |
| 3) burns | 4) expands |

28.

- | | |
|-------------|--------------|
| 1) provides | 2) collects |
| 3) removes | 4) maintains |

29.

- | | |
|-------------|-----------|
| 1) momentum | 2) pull |
| 3) exhaust | 4) thrust |

30.

- | | |
|------------|-----------|
| 1) motions | 2) speeds |
| 3) rates | 4) ratios |



APPENDIX A

“Practice Tests”

PRACTICE TEST 1

Required Time: 5 Minutes

Read the following passage and choose the correct choice.

Many chemical industries require large amounts of low-cost electrical power for their operations. Hydro power, developed in times when capital and interest costs were low, is frequently very inexpensive, but most large sources in the developed countries have been exploited, and small units produce electricity at higher cost. Hydroelectric plants must be situated where a head of water is available from a waterfall or a dam. This water is used to drive a turbine attached directly to a generator. The initial cost of a hydroelectric plant is much greater than that of a steam plant of identical size, but the operating cost is far lower.

1. What is the main topic of this passage?

- 1) Electrical power in developed countries
- 2) Hydroelectric power
- 3) Low-cost electrical power
- 4) Initial and operating costs of a hydroelectric power

2. The word "exploited" (underlined) is closest in meaning to which of the following?

- 1) to use or develop fully
- 2) to misuse
- 3) to misapply
- 4) to abuse

3. The operating cost of a hydroelectric plant is

- 1) much higher than that of a steam plant
- 2) almost the same as that of a steam plant
- 3) much lower than that of a steam plant
- 4) fairly lower than that of a steam plant

4. The word "identical" (underlined) is closest in meaning to which of the following?

- 1) The same
- 2) Unlike
- 3) Unified
- 4) Not like



PRACTICE TEST 2

Required Time: 10 Minutes

Choose the word or phrase that is closest in meaning to the underlined word or phrase.

1. The modern steam engine was first used to facilitate the mining of coal.

- 1) make easy or easier 2) harden 3) make difficult 4) retard

2. There are many means of converting mechanical energy into thermal energy.

- 1) descriptions 2) methods 3) theories 4) benefits

3. The production of steel and the mining of coal are predominant industries of Pennsylvania.

- 1) principal 2) inactive 3) archaic 4) overlooked

Choose the correct choice.

4. is the tendency of matter to return to its original size or shape, after having been stretched or compressed.

- 1) uniformity 2) plasticity 3) elasticity 4) rigidity

5. is the stress at which a substantial amount of plastic deformation takes place under constant or reduced load.

- 1) fracture point 2) yield point 3) fatigue 4) failure

When a temperature gradient exists in a body, experience has shown that there is an ... 6 ... transfer from the high-temperature region to the low- temperature region. We say that the energy is transferred by ... 7 ... and that the heat transfer ... 8 ... per unit ... 9 ... is ... 10 ... to the normal temperature gradient.

6.

- 1) temperature 2) mass 3) momentum 4) energy

7.

- 1) radiation 2) convection 3) conduction 4) diffusion

8.

- 1) ratio 2) rate 3) value 4) amount

9.

- 1) length 2) width 3) region 4) area

10.

- 1) disproportional 2) proportional 3) lateral 4) vertical



PRACTICE TEST 3

Required Time: 12 Minutes

Read the following passage and choose the correct choice.

Magnesium is another mineral we now obtain by collecting huge volumes of ocean water and treating it with chemicals, although originally it was derived only from brines or from the treatment of such magnesium-containing rocks as dolomite, of which whole mountain ranges are composed. In a cubic mile of seawater there are about four million tons of magnesium. Since the direct extraction method was developed about 1941, production has increased enormously. It was magnesium from the sea that made possible the wartime growth of the aviation industry, for every airplane made in the United States (and in most other countries as well) contains about half a ton of magnesium metal. And it has innumerable uses in other industries where a lightweight metal is desired, besides its long standing utility as an insulating material, and its use in printing inks, medicines, and toothpastes.

1. What is the main topic of this passage?

- 1) Uses of seawater
- 2) Treatment of seawater
- 3) Chemical properties of magnesium
- 4) Derivation and uses of magnesium

2. According to the passage, magnesium was first obtained from

- 1) rocks found on land
- 2) great amounts of ocean water
- 3) the sea floor
- 4) major industrial sites

3. According to the passage, which of the following was a direct consequence of the new method of obtaining magnesium?

- 1) The development of insulation materials
- 2) Increased airplane production
- 3) Improved medical facilities
- 4) The development of cheap inks for printing

4. According to the passage, why is magnesium important to industry?

- | | |
|---------------------|---------------------------------|
| 1) It is strong | 2) It conducts heat well |
| 3) It weighs little | 4) It is inexpensive to produce |

5. It can be inferred from the passage that during the past fifty years the demand for magnesium has

- | | |
|-----------------------|-----------------------|
| 1) declined greatly | 2) remained stable |
| 3) increased slightly | 4) risen dramatically |

Choose the correct choice.

6. ... is the fluid property that causes shear stresses in a moving fluid.

- | | |
|--------------|------------------|
| 1) Density | 2) Specific heat |
| 3) Viscosity | 4) Elasticity |

- 7. Linen could not be manufactured by machines until recently because the inelasticity of the fibres caused them to break readily under tension.**
- | | |
|-----------------|---------------|
| 1) unevenly | 2) easily |
| 3) unexpectedly | 4) ultimately |
- 8. Pollutants introduced into a lake can rapidly accelerate its natural aging process.**
- | | |
|----------------|-------------|
| 1) change | 2) speed up |
| 3) turn around | 4) destroy |
- 9. When heat travels by conduction, ... moves through a material without carrying any of the material with it.**
- | | |
|------------|----------|
| 1) what it | 2) which |
| 3) it | 4) and |
- 10. Sustained industrial growth and strong consumer spending must be present in order for an economy to grow.**
- | | |
|-------------|---------------|
| 1) tangible | 2) consistent |
| 3) moderate | 4) measurable |



PRACTICE TEST 4

Required Time: 15 Minutes

Read the following passage and choose the correct choice.

To understand the forces behind thunder and lightning, one must recall basic information about electricity, that things can become either positively or negatively charged with electricity and that two things with opposite charges will attract each other. As the opposite charges become stronger, the attraction becomes greater; eventually the attraction becomes strong enough to result in a discharge that makes two things electrically neutral again.

Lightning results when one cloud full of moisture develops an opposite charge in relation to another cloud. The pressure continues to build until there is enough pressure to break down the air separating the two clouds. A discharge occurs to neutralize the opposite charges in the two clouds, and this discharge is what we see as lightning. As this discharge of lightning is occurring, the lightning follows the "path of least resistance"; it therefore does not follow a straight line but zigzags in order to find the easiest route.

Thunder occurs during the discharge of electricity. As the discharge occurs, the air in the vicinity expands and contracts rapidly; the rushing air currents collide, causing the sound that we hear as thunder. Light travels far faster than sound (the speed of light is 186,284 miles per second, while the speed of sound is 1,100 feet per second), so we see the light first and then hear the sound later. Of course, the farther away the thunder and lightning are, the greater the lapsed time between the two. In fact the amount of lapsed time between the two can be used to determine how far away the thunder and lightning are.

1. What does the passage mainly discuss?

- 1) Basic information about electricity
- 2) The causes of thunder and lightning
- 3) How lightning occurs
- 4) Why thunder and lightning do not seem to occur together

2. Which of the following is NOT true about electric charges?

- 1) Something can have either a positive charge or a negative charge.
- 2) If one thing is positive and the other is negative, they will attract each other.
- 3) If two things have strong negative charges, they will attract each other strongly.
- 4) If the attraction between two things gets very strong, a discharge can occur.

3. The word "moisture" in the second paragraph is closest in meaning to

- | | |
|------------|--------------------|
| 1) wetness | 2) electricity |
| 3) gas | 4) positive charge |

4. The word "break down" in the second paragraph is closest in meaning to

- | | |
|-------------|---------------|
| 1) collapse | 2) take part |
| 3) both 1&4 | 4) take apart |

5. The passage states that lightning occurs when opposite charges develop in two

- | | |
|----------------------|-----------------|
| 1) drops of moisture | 2) air currents |
| 3) paths | 4) clouds |

6. The "path of least resistance" in the second paragraph is what type of path?

- | | |
|------------------|----------------------------------|
| 1) The easiest | 2) The strongest |
| 3) The brightest | 4) The most electrically charged |

7. The word "zigzags" in the second paragraph indicates that something

- | | |
|------------------------------|-------------------|
| 1) curves | 2) moves directly |
| 3) proceeds with sharp turns | 4) shines |

8. The word "contracts" in the third paragraph is closest in meaning to

- | | |
|-------------------|---------------|
| 1) becomes larger | 2) associates |
| 3) speeds up | 4) reduces |

9. The word "far" in the third paragraph means

- | | |
|---------------|--------------|
| 1) relatively | 2) extremely |
| 3) fairly | 4) much |

10. Which of the following is implied in the passage?

- 1) The speed of sound is faster than the speed of light.
- 2) If you see and hear something at the same time, it is far away.
- 3) Humans can travel faster than the speed of light.
- 4) Something that is very close will be seen and heard at roughly the same time.

11. The paragraph following the passage most probably discusses

- 1) why lightning is not straight
- 2) the speed of light versus the speed of sound
- 3) further characteristics of electricity
- 4) figuring out how far away thunder and lightning are



PRACTICE TEST 5

Required Time: 15 Minutes

Fill in the blanks with the most appropriate words.

1. You might get there on time if you now.

- | | |
|--------------------|----------------|
| 1) would have left | 2) will leave |
| 3) leave | 4) are leaving |

2. We went on a package holiday so we about meals and accommodation.

- | | |
|-------------------------|------------------------|
| 1) didn't have to worry | 2) mustn't worry |
| 3) had to be worried | 4) couldn't be worried |

3. I don't know whether she will win the race, but she's certainly very

- | | |
|------------|-----------|
| 1) swiftly | 2) quick |
| 3) fast | 4) speedy |

4. I am surprised that a company with your good would produce such poor quality goods.

- | | |
|--------------|---------------|
| 1) character | 2) reputation |
| 3) prestige | 4) fame |

5. Duplicated material illustrating the lecture was to the students.

- | | |
|----------------|----------------|
| 1) given away | 2) put forward |
| 3) set forward | 4) handed out |

6. He didn't speak but left the room the door behind him.

- | | |
|-------------|--------------|
| 1) fixing | 2) sliding |
| 3) slamming | 4) fastening |

Read the following passage and choose the correct choice.

The profession of engineering takes the knowledge of mathematics and natural sciences gained through study, experience, and practice and applies this knowledge with judgement to develop ways to utilize the materials and forces of nature for the benefit of all humans.

An engineer is a person who possesses this knowledge of mathematics and natural sciences, and through the principles of analysis and design, applies this knowledge to the solution of problems and the development of devices, processes, structures, and systems for the benefit of all humans.

The end result of an engineering effort, generally referred to as design, is a device, structure, system, or process which satisfies a need. A successful design is achieved when a logical procedure is followed to meet a specific need. The procedure, called the design process, is similar to the scientific method with respect to a step-by-step routine, but it differs in goals and end results. The design process encompasses the following activities, all of which must be completed.

- | | |
|-----------------------------|--------------------------|
| 1) Identification of a need | 6) Alternative solutions |
| 2) Problem definition | 7) Analysis |
| 3) Search | 8) Decision |
| 4) Constraints | 9) Specification |
| 5) Criteria | 10) Communication |

In the majority of cases, designs are not accomplished by an engineer simply completing the 10 steps shown in the order given. As the designer proceeds through each step, new information may be discovered and new objectives may be specified for the design. If so, the designer must backtrack and repeat steps. For example, if none of the alternatives appear to be economically feasible when the final solution is to be selected, the designer must redefine the problem or possibly relax some of the criteria to admit less expensive alternatives. Thus, because decisions must frequently be made at each step as a result of new developments or unexpected outcomes, the design process becomes iterative.

7. What does "possess" mean in the 2nd paragraph?

- 1) Have 2) Play 3) Postpone 4) Practice

8. What does "encompass" mean in the 3rd paragraph?

- 1) Remind 2) Protect 3) Explain 4) Cover

9. The of an engineering effort of design is usually a device, or a structure which satisfies a need.

- 1) Application 2) Object
3) Process 4) Routine

10. Under what circumstances the designer should possibly modify and reduce some aspects of the problem.

- 1) When it is difficult to justify within the budget limits.
2) When it is difficult to define the problem.
3) When it is difficult to analyze the problem.
4) When it is difficult to communicate with other designers.



PRACTICE TEST 6

Required Time: 12 Minutes

Fill in the blanks with the most appropriate words.

1. I cut the cake into several pieces to make sure that everyone got a

- | | |
|--------------|---------------|
| 1) portion | 2) motivation |
| 3) promotion | 4) motion |

2. I'm sure she'll do all she can

- | | |
|----------------|------------|
| 1) help | 2) helping |
| 3) for helping | 4) to help |

3. It was snowing he went out for a walk.

- | | |
|-------------|----------------|
| 1) however | 2) in addition |
| 3) moreover | 4) otherwise |

4. A liar is a person habitually tells lies.

- | | |
|----------|----------|
| 1) which | 2) who |
| 3) whom | 4) whose |

5. You include this section. It's not necessary.

- | | |
|------------------|---------------|
| 1) couldn't | 2) might need |
| 3) don't have to | 4) must |

6. The Noble prize is one of the most awards that a person can win.

- | | |
|------------------|--------------|
| 1) prestigious | 2) pessimist |
| 3) perfectionist | 4) permanent |

7. A marriage is likely to if you and your partner are similar in personality.

- | | |
|-----------|----------|
| 1) refuse | 2) refer |
| 3) pass | 4) last |

Read the following passage and choose the correct choice.

When the mixture is ignited, the products of combustion expand down the cylinder, which is fitted with a reciprocating piston. The downward movement of the piston is converted into a rotational movement of the crankshaft by means of a connecting rod. As the crankshaft rotates, the piston is driven upwards again, and the exhaust gases are expelled through the exhaust valve in the cylinder head. When the piston nears the top of this stroke, the inlet valve is opened and the exhaust valve closed. The piston then descends on the induction stroke, and draws a fresh charge into the cylinder. As the piston rises again on the compression stroke, the charge is compressed and ignited, and the cycle begins again. This is the four-stroke cycle which is in common use. An alternative cycle is the two-stroke cycle, which combines the exhaust and compression strokes into one.

8. What is the function of the connecting rod?

- 1) To produce a downward movement for the piston.
- 2) To produce a rotational movement for the crankshaft.
- 3) To descend the piston on the induction stroke.
- 4) To convert the downward movement of the piston into a rotational movement.

9. In which stroke is the inlet valve opened and the exhaust valve closed?

- | | |
|--------------|----------------|
| 1) None | 2) Exhaust |
| 3) Induction | 4) Compression |

10. A two-stroke cycle combines the strokes into one.

- 1) exhaust and induction strokes
- 2) exhaust and compression strokes
- 3) compression and induction strokes
- 4) ignition and compression strokes



PRACTICE TEST 7

Required Time: 12 Minutes

Fill in the blanks with the most appropriate words.

1. I am in of putting the question to a vote.

- | | |
|--------------|------------|
| 1) agreement | 2) favor |
| 3) mind | 4) opinion |

2. Her object in examining a number of new cars was to which make was best.

- | | |
|--------------|------------|
| 1) determine | 2) protect |
| 3) satisfy | 4) taste |

3. I rushed out of the room, knowing that it would be difficult to control my if she continued being rude.

- | | |
|-----------|----------------|
| 1) moral | 2) morality |
| 3) temper | 4) temperament |

4. The hijackers kept the pilot on board the plane as a

- | | |
|------------|------------|
| 1) damage | 2) hostage |
| 3) luggage | 4) package |

5. An engine may be cooled, but the vast majority are cooled.

- | | |
|-----------------|-------------------------------|
| 1) water, air | 2) water, oil |
| 3) water, water | 4) either water or air, water |

6. steel will not tarnish when exposed to the atmosphere.

- | | |
|--------------|----------------|
| 1) Alloy | 2) Low-carbon |
| 3) Stainless | 4) High-carbon |

7. "Viscosity" is a property related to

- | | |
|------------|--------------|
| 1) metals | 2) fluids |
| 3) welding | 4) machining |

Read the following passage and choose the correct choice.

Because so few real flows can be solved exactly by analytical methods alone, the development of fluid mechanics has depended heavily on experimental results. Solutions of real problems usually involve a combination of analysis and experimental information. First, the real physical flow situation is approximated with a mathematical model that is simple enough to yield a solution. Then experimental measurements are made to check the analytical results. Based on the measurements, refinements in the analysis are made. The experimental results are an essential link in this iterative process. Empirical designs, developed without analysis or careful review of available experimental data, are often high in cost and poor or inadequate in performance.

8. According to the text,

- 1) experimental results are available for all fluid flows.
- 2) many fluid flows can be solved by analytical methods only.
- 3) analytical methods are available for most real fluid flows.
- 4) only a small number of real fluid flows can be solved by mathematical techniques alone.

9. According to the author,

- 1) designs made based merely on empirical concepts are not recommended.
- 2) experimental results are as essential as empirical concepts in a design.
- 3) empirical designs are as useful as designs based on experimental results.
- 4) empirical concept designs are always invalid and must be avoided due to poor performance.

10. The author believes that

- 1) experiments are used to verify the analytical results.
- 2) mathematical models justify experimental measurements.
- 3) the experimental results are necessary to obtain the analytical results.
- 4) the analytical results and mathematical models must be obtained to verify the experimental results.



PRACTICE TEST 8

Required Time: 12 Minutes

Fill in the blanks with the most appropriate words.

1. "Innovation" is

- 1) in reference to the standard of living.
- 2) the art of creating new ideas.
- 3) is a basic term in quality control.
- 4) defined as producing useful products.

2. is a phenomenon which is most likely discussed in a course on system vibrations.

- | | |
|---------------|----------------|
| 1) Combustion | 2) Ductility |
| 3) Resonance | 4) Deformation |

Directions. In each of the following sentences, four words or phrases have been underlined. You should choose the one word or phrase that would not be appropriate in standard written English. Circle your choice.

3. As soon as he will graduate from university, he can get a good job at an academic center.

1 2 3 4

4. John Dewey thought that children learning better through participating in experiences rather than through listening to lectures.

1 2 3 4

Read the following passage and choose the correct choice.

The mechanical engineer traditionally has been esteemed as exceptionally qualified for the task of overall management of industrial plants. The nature of his training and experience, the breadth of his interests, and his necessary awareness of the requirements of other branches of engineering, all combine to fit him for such general supervision and control. The very name and idea of a now generally accepted concept of management arose from the researches of an American mechanical engineer, Frederick W. Taylor. Taylor's investigations, which began at a humble level with such studies as the determination of the proper load for the shovel of a coal heaver, grew by steady degrees into a method for evaluating the operations of a whole plant. His system of scientific management, visualizing "the efficient, functionalized organization" of an enterprise, has become a recognized guide in industrial planning and operation. Including Taylor's concept, but broader still, is the function of industrial engineering, a profession often considered a branch of mechanical engineering but alternately regarded as a separate province of engineering in its own right. In any case, the ties between the two are exceedingly close, and the training and experience of the mechanical engineer continue to make him a preferred candidate for positions in the broader field of management.

5. According to the passage, which of the following is NOT involved in the supervisory task of a mechanical engineer?

- 1) The extent of his interests.
- 2) His awareness of related disciplines.
- 3) His system of industrial planning.
- 4) The type of his training and experience.

6. What does "the two" (underlined) in line 12 refer to?

- 1) Training and experience.
- 2) Taylor and an unnamed researcher.
- 3) Industrial planning and operation.
- 4) Mechanical and industrial engineering.

7. What did Taylor introduce?

- 1) The coal heaver.
- 2) The first industrial plant.
- 3) The current idea of management.
- 4) The concept of mechanical engineering.

8. What does the word "breadth" (underlined) in line 2 mean?

- | | |
|---------------|-----------------|
| 1) Width | 2) Broadness |
| 3) Narrowness | 4) both 1 and 2 |

9. What does the word "exceedingly" (underlined) in line 12 mean?

- | | |
|---------------|----------------|
| 1) Totally | 2) Extremely |
| 3) Relatively | 4) Practically |

10. Why did Taylor study the load for the shovel of a coal heaver?

- 1) To calculate the proper load.
- 2) To determine the efficiency of the heaver.
- 3) To evaluate a method of investigation.
- 4) To design the system of industrial management.



PRACTICE TEST 9

Required Time: 15 Minutes

Fill in the blanks with the most appropriate words.

1. **When I was in Mashad, I saw a great friend of**

1) her	2) they
3) me	4) yours
2. **We enjoyed our holiday the poor weather.**

1) despite	2) in spite
3) although	4) even though
3. **Our attempt to reach the top of the mountain ended failure.**

1) to	2) by
3) in	4) up
4. **I don't know how she'll to the news when you tell her.**

1) hear	2) react
3) answer	4) behave
5. **If you are by something, it causes you to behave in a particular way.**

1) frightened	2) reminded
3) wounded	4) motivated
6. **If you don't know the meaning, in a dictionary.**

1) look after it	2) see to it
3) look it up	4) see it off

In the following letter, some words or phrases are missing. Fill in the blanks with the most appropriate words.

Dear Alex,

I regret that I will be unable to meet you when you 7 at the airport because I will be at work. Unfortunately, there is no easy way of getting here apart from taking a taxi, which would be very expensive.

Therefore, if you do not have too much luggage, I would 8 taking the underground. You will have to change twice to reach the nearest station (GREENWOOD PARK). When you come out of the station, turn left and walk along the main road past Tesco supermarket and take the first left (South Road). Pine Road is on the right and 12A is on the first 9 My mother will be there to welcome you!

However, if you have time for a slower journey, there is a direct bus (No 108) which will take you all the way from the airport and there is a stop 10 Greenwood Park Station. Ask the driver to tell you when to get off.

Looking forward 11 you on Friday evening.

7.

- | | | | |
|-----------|------------|-----------|------------|
| 1) return | 2) receive | 3) arrive | 4) go back |
|-----------|------------|-----------|------------|

8.

- | | | | |
|------------|------------|------------|------------|
| 1) suggest | 2) predict | 3) pretend | 4) suppose |
|------------|------------|------------|------------|

9.

- 1) part 2) class 3) ground 4) floor

10.

- 1) besides 2) opposite 3) against 4) under

11.

- 1) see 2) to see 3) to seeing 4) seeing

Read the following passage and choose the correct choice.

Propeller manufacturers offer propellers covering a range of diameters, pitch values, and solidities. The choice of these parameters can depend on considerations other than aerodynamic efficiency. For example, to keep the noise level of a propeller low, one may have to employ wide blades with low tip speeds. As another example, the propeller diameter is sometimes limited by ground clearance considerations or by the distance from a nacelle to the fuselage. The dynamics of the propeller must also be matched to the engine. The natural frequency of the first bending mode of a blade should not coincide with an impulse frequency from the engine. For example, a horizontally opposed, six-cylinder engine has three torsional peaks per revolution. If a propeller being driven by this engine has a natural frequency close to 3/rev, it can lead to excessive vibration and fatigue stresses.

12. A propeller with wide blades and low tip speeds

- 1) generates low noise 2) has a high angular velocity
3) will not generate noise at all 4) has a low speed and high noise level

13. A propeller diameter is limited by ground clearance. This means that the propeller can not be

- 1) too wide 2) very light 3) too long 4) very heavy

14. The design parameters of a propeller

- 1) are solely based on manufacturers
2) cannot depend on an aerodynamic efficiency
3) may not all be necessarily based on aerodynamic efficiency
4) cover a range of factors solely based on aerodynamic efficiency

15. The natural frequency of a propeller

- 1) is unrelated to that of the engine
2) must be close to that of the engine
3) must be equal to that of the engine
4) must be away from that of the engine



PRACTICE TEST 10

Required Time: 15 Minutes

Fill in the blanks with the most appropriate words.

1. "The temperature of the cooling medium, usually air, immediately surrounding the motor or another device" is a definition for
 - 1) temperature ratio
 - 2) ambient temperature
 - 3) base temperature
 - 4) minute temperature
2. "Play or stop in mechanical systems such as bearings and gears" is technically called
 - 1) pitch
 - 2) backlash
 - 3) back-drive
 - 4) circular pitch
3. "The minimal torque present in an unenergized motor" is technically called torque.
 - 1) stall
 - 2) running
 - 3) detent
 - 4) holding
4. Gasoline is fired by spark plugs in the engine.
 - 1) excited
 - 2) ignited
 - 3) scorched
 - 4) struck
5. is a term describing any material whose physical properties depend upon direction relative to some defined axes.
 - 1) Isotropic
 - 2) Homogeneous
 - 3) Anisotropic
 - 4) Magnetic
6. Unlike liquids, gases are easily compressed and hence, the effect of and changes of internal energy must be considered.
 - 1) expansivity
 - 2) compressibility
 - 3) variability
 - 4) stability
7. Should the heat transfer coefficient of the fluid flowing inside a tube be lower than that flowing on the outside, then the inner surfaces of the tube may be provided with fins
 - 1) to support the tubes
 - 2) to facilitate heat transfer
 - 3) to reduce rate of energy flow
 - 4) to restrict the path of flow

Read the following passage and choose the correct choice.

Machine design is the application of science and invention to the development and construction of machines. An understanding of the basic laws of nature is essential to a proper perspective in the approach to machine design. Knowledge of the past development of machine elements makes possible their effective application. Inventiveness consists of producing new combinations of old elements or, where extreme need arises, of exercising genius either in breaking the bounds of convention, or in evolving new principles not either applied or known.

In machine design, accomplishment takes on two forms: one is the drawings and blueprints, which completely describe the machine, and the other is the assembled product. In addition, most machines go through periods of evolution, and later models may show little outward similarity to the original design.

Machine design consists of the conception of a machine that will meet a specific need. Before constructing a machine to fulfill the need, the designer must thoroughly understand the application, and mentally modify an old machine or devise a new machine as required. A certain cost for the machine and a probable time for its construction are estimated. These estimates consider the materials required, the equipment necessary for its manufacture and testing, and the final operation in meeting the original need. If the machine is desirable,

construction of the unit follows. In time the machine may become obsolete due to advances in the technology; it may then be rebuilt or replaced, possibly under the direction of the original designer.

The working tools in machine design are an understanding of the basic elements of machines that have been developed in the past and a thorough knowledge of the mechanical fields of science including mathematics, physics, statics and dynamics, strength of material, kinematics, mechanisms, and the laboratories associated with them.

8. According to the passage, the second aspect of success in designing a machine is

- 1) the end product of assembly
- 2) preparing the blueprints
- 3) describing the machine
- 4) manufacturing and testing

9. designing machines is a process which primarily requires

- 1) the development of new principles
- 2) a good knowledge of statics and dynamics
- 3) understanding of the basic laws of nature
- 4) the effective application of scientific concepts

10. The word "obsolete" (underlined) in the third paragraph is closest in meaning to

- 1) damaged
- 2) definite
- 3) non-standard
- 4) old-fashioned

11. Which of the following statements is NOT true?

- 1) A designer may change an old machine in his mind.
- 2) Inventiveness requires the use of totally new elements.
- 3) A certain cost for machine is estimated prior to their construction.
- 4) A complete knowledge of mechanical sciences is a tool in machine design.

12. In machine design, genius may be required because of

- 1) extreme need
- 2) the basic laws of nature
- 3) the bounds of convention
- 4) the knowledge of past development



PRACTICE TEST 11

Required Time: 20 Minutes

Part A: Fill in the blanks with the most appropriate words.

1. Heat is a path function, defined as it the boundaries of a system.

- | | |
|--------------|------------|
| 1) crosses | 2) conveys |
| 3) displaces | 4) follows |

2. Some fluid machines possess a rotor having a number of vanes or

- | | |
|------------|----------------|
| 1) blowers | 2) compressors |
| 3) blades | 4) impellers |

3. The resulting vibration of a system exposed to an external force is called vibration.

- | | |
|-----------|-------------|
| 1) free | 2) forced |
| 3) damped | 4) undamped |

4. Automation is a technique that can be used to costs and/or to improve quality.

- | | |
|-------------|------------|
| 1) automate | 2) control |
| 3) organize | 4) reduce |

Part B: Read the following passages and choose the correct choice.

Reading A

A pilot cannot fly a plane by sight alone. In many conditions, such as flying at night and landing in dense fog, a pilot must use radar, an alternative way of navigating. Since human eyes are not very good at determining speeds of approaching objects, radar can show a pilot how fast nearby planes are moving. The basic principle of radar is exemplified by what happens when one shouts in a cave. The echo of the sounds against the walls helps a person determine the size of the cave. With radar, however, the waves are radio waves instead of sound waves. Radio waves travel at the speed of light, about 300,000 kilometers in one second. A radar set sends out a short burst of radio waves. Then it receives the echoes produced when the waves bounce off objects. By determining the time takes for the echoes to return to the radar set, a trained technician can determine the distance between the radar set and other objects. The word "radar," in fact, gets its name from the term "radio detection and ranging." "Ranging" is the term for detection of the distance between an object and the radar set. Besides being of critical importance to pilots, radar is essential for air traffic control, tracking ships at sea, and for tracking weather systems and storms.

5. What is the main topic of this passage?

- | | |
|-------------------------|------------------------|
| 1) Types of ranging | 2) History of radar |
| 3) Alternative to radar | 4) The nature of radar |

6. According to the passage, what can radar detect besides location of objects?

- | | |
|----------|-----------|
| 1) Size | 2) Speed |
| 3) Shape | 4) Weight |

7. Which of the following words best describe the tone of this passage?

- | | |
|----------------|------------------|
| 1) Humorous | 2) Imaginative |
| 3) Explanatory | 4) Argumentative |

8. The word "tracking" (underlined) is closest in meaning to which of the following?

- | | | | |
|------------------|--------------|----------------|-------------|
| 1) Searching for | 2) Repairing | 3) Glancing at | 4) Fighting |
|------------------|--------------|----------------|-------------|

Reading B

Thermodynamics is based on two experimentally observed laws. The first is the law of conservation of energy, familiar to the student from the study of classical mechanics. Whereas in mechanics only potential and kinetic energies are involved, in thermodynamics the law of conservation of energy is extended to include thermal and other forms of energy. When an energy transformation occurs, the same total energy must be present after the transformation as before; in other words, according to the first law, all the different types of energy must be accounted for and balanced out when a transformation occurs. The first law merely states that energy can be neither created nor destroyed; it does not provide information as to the ultimate distribution of the energy in its various forms.

The second law provides further information about energy transformation. For example, it places a limitation on the amount of useful mechanical work that can be obtained from combustion of the fuel in an automobile engine. The first law states that energy must be conserved. Thus, according to the first law, all the thermal energy available from combustion of the fuel could be converted to useful mechanical work with no losses. Intuitively, however, we know that thermal and other losses are present in the engine. The second law provides a quantitative prediction of the extent of these losses.

9. According to the first law of thermodynamics, the same amount of energy must be provided when

- | | |
|------------------------------------|--|
| 1) an energy cycle is constant | 2) energy can be found in a thermal form |
| 3) an energy transformation occurs | 4) energy is used in mechanics |

10. The first law of thermodynamics is NOT capable of

- 1) stating anything about the conservation of energy
- 2) accounting for the different types of energy during transformation
- 3) giving the information concerning the final distribution of energy
- 4) expressing anything related to the creation or destruction of energy

11. The second law of thermodynamics can

- 1) determine the amount of useful work done by energy
- 2) provide the information about energy conservation
- 3) utilize all kinds of energy available in a device
- 4) prepare a qualitative prediction of the extent of losses

12. The word "transformation" in line 5 is closest in meaning to

- | | |
|----------------|----------------|
| 1) consumption | 2) utilization |
| 3) application | 4) change |

Reading C

Near the forward stagnation point on a wing, or near the leading edge of a flat plate, the boundary layer is laminar. As the flow proceeds downstream, the boundary layer thickens and the viscous forces continue to dissipate the energy of the airstream. Disturbances to the flow in the growing viscous layer may be caused by surface roughness, a temperature variation in the surface, pressure pulses, and so on. If the Reynolds number is low, the disturbances will be damped by viscosity and the boundary layer will remain laminar. At higher Reynolds numbers, the disturbances grow. In such cases, the boundary layer may become unstable and, eventually, turbulent, i.e., transition will occur. The details of the transition process are quite complex and depend on many parameters.

The engineer who must develop a transition criterion for design purposes usually uses the Reynolds number. For instance, if the surface of a flat plate is smooth and if the external airstream has no turbulence, transition occurs at a Reynolds number (Re_x) of approximately 500,000. However, experience has shown that the Reynolds number at which the disturbances will grow and the length over which the transition process takes place depends on the magnitude of the disturbances and on the flow field.

13. The boundary layer thickening is

- | | |
|-------------|-------------|
| 1) desired | 2) harmful |
| 3) doubtful | 4) charming |

14. Major causes of boundary layer thickening are

- | | |
|----------------------|-------------------------|
| 1) surface roughness | 2) temperature gradient |
| 3) both 1 and 2 | 4) neither 1 and 2 |

15. A major characteristic of laminar flow is

- | | |
|---------------------------|-------------------------|
| 1) high surface roughness | 2) fast pressure pulses |
| 3) low Reynolds number | 4) thick viscous layer |

16. One can substantiate that instability is a feature of

- | | |
|--------------------|----------------------|
| 1) Reynolds number | 2) turbulent flow |
| 3) laminar flow | 4) surface roughness |

17. At Reynolds number of 500,000 one can expect the transition to start

- | | |
|----------------------------|------------------------|
| 1) over a smooth surface | 2) in a turbulent flow |
| 3) from a design criterion | 4) by experience |

18. The word "dissipate" (underlined) in the first paragraph is closest in meaning to

- | | |
|---------------|----------------|
| 1) accumulate | 2) concentrate |
| 3) gather | 4) dispel |

Good Luck! S. Ghazimoradi



APPENDIX B

“Suffixes & Prefixes”

Word formation - Suffixes

AFFIXES

PREFIXES + (STEM) + SUFFIXES

SUFFIXES

NOUNS	VERBS	ADJECTIVES	ADVERBS
-ance	-ize	-able	-ly
-ence	-ate	-ible	
-or	-fy	-less	
-er	-en	-ic	
-ist	-ify	-ical	
-ness		-ish	
		-ive	

Noun-forming suffixes

SUFFIX	MEANING	EXAMPLES
-ance	state	performance
-ence	quality of	independence
-er, -or	a person who a thing which	programmer, operator compiler, accumulator
-ation	the act of	execution
-tion		
-ist	a person who	analyst, typist
-yst		
-ness	condition of	cleanliness
-ion	action/state	conversion
-ing	activity	multiplexing
-ment	state, action	measurement
-ity	state, quality	electricity
-ian	pertaining to	electrician
-ism	condition/state	magnetism
-dom	domain/condition	freedom
-ship	condition/state	relationship, partnership, friendship
-ary		binary

Verb-forming suffixes

SUFFIX	MEANING	EXAMPLES
-ize	to make	computerize
-ate		automate, activate, calculate
-fy		simplify
-en		harden, widen

Adverb-forming suffix

SUFFIX	MEANING	EXAMPLES
-ly	in the manner of	electronically, logically, comparably, helpfully

Adjective-forming suffixes

SUFFIX	MEANING	EXAMPLES
-al	have the quality of	computational, logical
-ar		circular
-ic		magnetic
-ical		electrical
-able	capable of being	comparable
-ible		divisible
-ous	like, full of	dangerous
-ious		religious
-ful	characterized by	helpful
-less	without	careless
-ish	like	yellowish
-ed	having	computed, punched
-ive	quality of	interactive
-ing	to make or do	programming, coding, processing, multiplexing

Word formation - prefixes

PREFIXES

NEGATIVE AND POSITIVE	SIZE	LOCATION	TIME AND ORDER	NUMBER
un-	semi-	inter-	pre-	mono-
non-	mini-	super-	ante-	bi-
in-	micro-	trans-	fore-	hex-
dis-		ex-	post-	oct-
re-		extra-		multi-
		mid-		

Negative and positive prefixes

PREFIX	MEANING	EXAMPLES
<u>Negative</u>		
un-	not,	unmagnetized, unpunched
in-	not good enough	incomplete
im-		impossible
il-		illegal
ir-		irregular, irrelevant
non-	not connected with	non-programmable, non-impact
mis-	bad, wrong	mispronounce
dis-	opposite feeling opposite action	disagree disconnect
anti-	against	antisocial
ae-	reduce, reverse	demagnetize, decode
under-	too little	underestimate
<u>Positive</u>		
re-	do again	reorganize
over-	too much	overheat, overuse

Prefixes of size

PREFIX	MEANING	EXAMPLES
semi-	half, partly	semiconductor
equi-	equal	equidistant
maxi-	big	maxicomputer
micro-	small	microcomputer
mini-	little	minicomputer
macro-	large	macroeconomics
mega-		megabyte

Prefixes of location

PREFIX	MEANING	EXAMPLES
inter-	between, among	interface, interactive
super-	over	supersonic
trans-	across	transmit, transfer
ex-	out	exclude, extrinsic
extra-	beyond	extraordinary
sub-	under	subschemata
infra	below	infra-red
peri-	around	peripheral

Prefixes of time and order

PREFIX	MEANING	EXAMPLES
ante- pre-	before	antecedent prefix
prime- post- retro-	first after backward	primary, primitive postdated retroactive

Prefixes of numbers

PREFIX	MEANING	EXAMPLES
semi-	half	semicircle
mono-	one	monochromatic
bi-	two	binary
tri-	three	triangle
quad-	four	quadruple
penta	five	pentagon
hex-	six	hexadecimal
septem-	seven	September
oct	eight	octal
dec-	ten	decimal
multi	many	multiprogramming, multiplexor

Other prefixes

PREFIX	MEANING	EXAMPLES
pro-	for	program
auto	self	automatic
co-	together	coordinate
neo-	new	neoclassical
pan-	all	Pan-American

APPENDIX C

“Answer Key”

SECTION 2 (M.Sc. EXAM'S QUESTIONS)

1374

1- (1)	2- (2)	3- (1)	4- (4)	5- (3)
6- (3)	7- (1)	8- (4)		

1375

1- (4)	2- (2)	3- (3)	4- (4)	5- (3)
6- (1)	7- (1)	8- (4)	9- (3)	10- (3)
11- (2)	12- (2)	13- (3)		

1376

1- (1)	2- (4)	3- (1)	4- (4)	5- (2)
6- (4)	7- (1)	8- (1)	9- (1)	10- (2)
11- (3)	12- (3)	13- (2)	14- (1)	15- (4)
16- (3)	17- (4)	18- (4)	19- (4)	20- (4)
21- (3)	22- (3)			

1377

1- (1)	2- (4)	3- (3)	4- (4)	5- (1)
6- (2)	7- (4)	8- (2)	9- (4)	10- (3)
11- (1)	12- (2)	13- (2)	14- (3)	15- (2)
16- (1)	17- (4)	18- (4)	19- (2)	

1378

1- (1)	2- (4)	3- (2)	4- (1)	5- (3)
6- (4)	7- (2)	8- (3)	9- (1)	10- (3)
11- (2)	12- (3)	13- (1)	14- (2)	15- (4)

1379

1- (1)	2- (2)	3- (4)	4- (4)	5- (3)
6- (4)	7- (1)	8- (1)	9- (2)	10- (4)
11- (2)	12- (3)	13- (3)	14- (1)	15- (2)

1381

1- (2)	2- (1)	3- (4)	4- (3)	5- (1)
6- (4)	7- (4)			

1382

1- (4)	2- (2)	3- (2)	4- (3)	5- (4)
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1383

1- (1)	2- (4)	3- (2)	4- (2)	5- (1)
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1384

1- (3)	2- (4)	3- (1)	4- (2)	5- (2)
6- (3)	7- (1)	8- (2)	9- (2)	10- (3)
11- (3)	12- (3)	13- (4)	14- (4)	15- (1)

1385

1- (1)	2- (3)	3- (1)	4- (4)	5- (3)
6- (4)	7- (3)	8- (2)	9- (4)	10- (3)
11- (1)	12- (2)	13- (1)	14- (4)	15- (2)

1386

1- (3)	2- (4)	3- (1)	4- (2)	5- (2)
6- (3)	7- (4)	8- (2)	9- (1)	10- (3)
11- (4)	12- (1)	13- (3)	14- (4)	15- (2)

1387

1- (2)	2- (1)	3- (3)	4- (2)	5- (3)
6- (4)	7- (1)	8- (1)	9- (4)	10- (1)
11- (3)	12- (2)	13- (2)	14- (3)	15- (4)

1388

1- (1)	2- (3)	3- (4)	4- (4)	5- (1)
6- (1)	7- (2)	8- (3)	9- (4)	10- (3)
11- (2)	12- (2)	13- (2)	14- (3)	15- (4)

SECTION 3 (SELECTED TESTS)

1- (4)	2- (3)	3- (1)	4- (3)	5- (2)
6- (3)	7- (4)	8- (3)	9- (3)	10- (4)
11- (1)	12- (2)	13- (4)	14- (3)	15- (4)
16- (2)	17- (3)	18- (4)	19- (2)	20- (1)
21- (2)	22- (2)	23- (4)	24- (4)	25- (2)
26- (3)	27- (1)	28- (1)	29- (4)	30- (2)

APPENDIX A (PRACTICE TESTS)

PRACTICE TEST 1

1- (2)	2- (1)	3- (3)	4- (1)
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PRACTICE TEST 2

1- (1)	2- (2)	3- (1)	4- (3)	5- (2)
6- (4)	7- (3)	8- (2)	9- (4)	10- (2)

PRACTICE TEST 3

1- (4)	2- (1)	3- (2)	4- (3)	5- (4)
6- (3)	7- (2)	8- (2)	9- (3)	10- (2)

PRACTICE TEST 4

1- (2)	2- (3)	3- (1)	4- (3)	5- (4)
6- (1)	7- (3)	8- (4)	9- (4)	10- (4)
11- (4)				

PRACTICE TEST 5

1- (3)	2- (1)	3- (3)	4- (2)	5- (4)
6- (3)	7- (1)	8- (4)	9- (2)	10- (1)

PRACTICE TEST 6

1- (1)	2- (4)	3- (1)	4- (2)	5- (3)
6- (1)	7- (4)	8- (2)	9- (3)	10- (2)

PRACTICE TEST 7

1- (1)	2- (1)	3- (3)	4- (2)	5- (4)
6- (3)	7- (2)	8- (4)	9- (1)	10- (1)

PRACTICE TEST 8

1- (2)	2- (3)	3- (1)	4- (1)	5- (3)
6- (4)	7- (3)	8- (4)	9- (2)	10- (1)

PRACTICE TEST 9

1- (4)	2- (1)	3- (3)	4- (2)	5- (4)
6- (3)	7- (3)	8- (1)	9- (4)	10- (2)
11- (3)	12- (1)	13- (1)	14- (3)	15- (4)

PRACTICE TEST 10

1- (2)	2- (2)	3- (1)	4- (2)	5- (3)
6- (2)	7- (2)	8- (1)	9- (3)	10- (4)
11- (2)	12- (1)			

PRACTICE TEST 11

1- (1)	2- (3)	3- (2)	4- (4)	5- (4)
6- (2)	7- (3)	8- (1)	9- (3)	10- (3)
11- (1)	12- (4)	13- (2)	14- (4)	15- (3)
16- (2)	17- (1)	18- (4)		

