INSTITUTE OF ENGINEERING

Model Entrance Exam

(Set-6)

Instructions:

There are 100 multiple-choice questions, each having four choices of which only one choice is correct.

Date: 2080/03/23
        (July-08)

Duration: 2 hours
Time: 8 AM – 10 AM

Section-A (1 marks)

1) The student <u>wrote</u> an application to his teacher. The underlined word is:
   a) adverb   b) verb   c) pronoun   d) noun

2) This journal _____ twice a month.
   a) is appearing   b) appeared   c) had appeared   d) appears

3) If I had a huge sum of money, I _____ my parents on the world tour.
   a) would took   b) shall take
   c) would have took   d) would take

4) He said to the interviewer, "Could you please repeat the question?"
   a) He requested the interviewer if he could please repeat the question.
   b) He requested the interviewer to please repeat the question.
   c) He requested the interviewer to repeat the question.
   d) He requested the interviewer if he could repeat the question.

5) He felt <u>*ill at ease*</u> after receiving the letter from his son.
   a) relieved   b) disturbed   c) sick   d) embarrassed

6) Frivolous (Antonym):
   a) trivial   b) significant   c) fearless   d) permissive

7) Belligerent (Synonym):
   a) pacifist   b) aggressive   c) generous   d) reasonable

8) You mustn't judge him _____ appearance.
   a) at   b) on   c) with   d) by

9) Transform the given sentence into interrogative:
   "A great deal of research has been done on the Science project."
   a) Has much research been done on the Science project?
   b) Has the Science project undergone research?
   c) The Science project is thoroughly researched, isn't it?
   d) Much research has been done on the Science project, isn't it?

10) The correct phonetic transcription of the word 'fridge' is:
    a) /fri: dz/   b) /fraIdz/   c) /frig/   d) /frIdz/

11) None of the information _____ conveyed.
    a) was   b) are   c) were   d) have been

12) Nothing has been accomplished, _____?
    a) has it   b) hasn't it   c) wasn't it   d) was it

13) The dimensional formula of electric potential is:
    a) $[ML^2T^{-3}A^{-1}]$ b) $[M^{-1}L^2T^{-2}A]$
    c) $[M^{-1}L^2T^{-2}A^{-1}]$ d) $[ML^2T^{-2}A]$

14) Penetrating power is greatest for:
    a) α-particle   b) β-particle   c) γ-rays   d) X-rays

15) In photoelectric effect:
    a) Light energy is converted into heat energy
    b) Light energy is converted into electric energy
    c) Light energy is converted into sound energy
    d) Electric energy is converted into light energy

16) Lenz's law gives:
    a) direction of magnetic field   b) direction of motion of conductor
    c) direction of induced circuit   d) direction of current in any electrical circuit

17) When a current flows along a junction of two different metals in series, heat is developed or absorbed depending on the direction of current. This effect is called:
    a) Joule effect   b) Seeback effect
    c) Peltier effect   d) Thomson effect

18) If electric field is uniform, then the electric lines of force are:
a) divergent   b) convergent   c) circular   d) parallel

19) If oil of higher density than that of water is used in place of water in a resonance tube, how does the frequency change?
a) increases
b) decreases
c) remain unchanged
d) first increases, becomes maximum and then decreases

20) Chromatic aberration of a lens is caused by:
a) interference   b) dispersion   c) reflection   d) diffraction

21) Deviation produced by a prism does not depend on:
a) angle of prism   b) material of prism
c) angle of incidence   d) size of prism

22) A sphere, a cube and a thin circular plate all made of same material and having the same mass are heated to a temperature of 200°C. When these are left in a room:
a) the sphere reaches room temperature at last
b) the cube reaches room temperature at last
c) the circular plate reaches room temperature at last
d) All will reach room temperature simultaneously

23) In the gas equation $PV = nRT$, V stands for volume of:
a) any amount of gas   b) one gram of gas
c) one gram mole of gas   d) one litre of gas

24) A container partly filled with liquid is suspended from a spring balance. A small body is gently dropped in the container. The reading of spring balance will:
a) increase   b) decrease
c) remain unchanged   d) continue oscillating

25) One end of a towel dips into a bucket full of water and the other end hangs over the bucket. It is found that after some time the whole towel becomes wet. It happens because:
a) viscosity of water is high   b) of capillary action of cotton threads
c) of gravitational force   d) of evaporation of water

26) Weightlessness experienced while orbiting the earth in a spaceship is the result of:
a) inertia   b) acceleration   c) zero gravity   d) centre of gravity

27) In parallel combination of n cells, we obtain:
a) more voltage   b) more current   c) less voltage   d) less current

28) A body of mass m collides against a wall with a velocity v and rebounds with the same speed. Its change of momentum is:
a) 2 mv   b) mv   c) – mv   d) Zero

29) Moment of inertia depends on
a) Torque   b) axis of rotation
c) Angular acceleration   d) Angular velocity

30) $\lim\limits_{x \to 0} \dfrac{e^{\sin x}-1}{x} =$
a) 1   b) e c) 0   d) $1/e$

31) $\dfrac{d}{dx}[\log(\sin x)] =$
a) x b) $\tan x$ c) $\cot x$ d) $1/x$

32) $f: N \to N$, where $f(x) = x - (-1)^x$, then f is:
a) one-one and into   b) many-one and into
c) one-one and onto   d) many-one and onto

33) The equation of normal to the curve $y^2 = 4x$ at the point (1, 2) is:
a) $x - y + 3 = 0$ b) $x + y - 1 = 0$
c) $x - y + 1 = 0$ d) $x + y - 3 = 0$

34) $\int (x \cot x + \log \sin x) dx =$
a) $\log(\sin x) + c$
b) $\log(\cos x) + c$
c) $x \log(\sin x) + c$
d) $x \log(\cos x) + c$

35) For what value of p, the difference of the roots of the equation $x^2 - px + 8 = 0$ is 2?
a) ± 2
b) ± 4
c) ± 6
d) ± 8

36) If the sum of n terms of an AP is $3n^2 + 5n$, then which of its terms is 164?
a) 26th
b) 27th
c) 28th
d) 29th

37) For a positive integer n, the expression $(1 - i)^n \left(1 - \frac{1}{i}\right)^n$ equals:
a) 0
b) $2i^n$
c) 2^n
d) 4^n

38) The number of diagonals that can be drawn by joining the vertices of a heptagon is:
a) 14
b) 21
c) 7
d) 28

39) If $A = \{y: y = 2x, x \in N\}, B = \{y: y = 2x - 1, x \in N\}$, then $(A \cap B)' =$
a) A
b) B
c) ϕ
d) U

40) If $P = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}$, then $P^2 + 2P - 3I$ is equal to:
a) $\begin{bmatrix} 4 & -6 \\ 6 & 4 \end{bmatrix}$
b) 0
c) $\begin{bmatrix} -6 & 2 \\ -2 & 6 \end{bmatrix}$
d) $5I$

41) The equation $x^2 + ky^2 + 4xy = 0$ represents two coincident lines if $k =$
a) 0
b) 1
c) 4
d) 16

42) The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a point circle if:
a) $g^2 + f^2 > c$
b) $g^2 + f^2 = c$
c) $g^2 + f^2 < c$
d) $g^2 + f^2 = 0$

43) If the line $3x - 4y + 5 = 0$ is a tangent to the parabola $y^2 = 4ax$, then $a =$
a) $\frac{15}{16}$
b) $\frac{5}{4}$
c) $\frac{4}{3}$
d) $\frac{4}{5}$

44) For the ellipse, $\frac{(x-3)^2}{9} + \frac{(y-5)^2}{25} = 1$, the length of major axis is equal to:
a) 3
b) 5
c) 6
d) 10

45) Dc's of a line lying in both xy plane and yz plane is:
a) 1, 1, 1
b) 0, 1, 0
c) 0, 0, 1
d) 1, 0, 0

46) The value of $4 \sin A \cos^3 A - 4 \cos A \sin^3 A$ is:
a) $\cos 8A$
b) $\sin 2A$
c) $\cos 4A$
d) $\sin 4A$

47) The general solution of $|\sin x| = \cos x$ is given by:
a) $n\pi + \frac{\pi}{4}$
b) $2n\pi \pm \frac{\pi}{4}$
c) $n\pi \pm \frac{\pi}{4}$
d) $n\pi - \frac{\pi}{4}$

48) If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1} x\right) = 1$, then x is equal to:
a) 5
b) 1
c) 1/5
d) 4/5

49) If $\vec{a}$ and $\vec{b}$ are unit vectors such that $\vec{a}.\vec{b} = \cos \theta$, then the value of $\vec{a} + \vec{b}$ is:
a) $2 \sin \frac{\theta}{2}$
b) $2 \sin \theta$
c) $2 \cos \frac{\theta}{2}$
d) $2 \cos \theta$

50) Components of a mixture of benzene and chlorobenzene can be separated by
a) simple distillation
b) sublimation
c) crystallization
d) using a separating funnel

51) Tautomerism will be exhibited by
a) $(CH_3)_3CNO$
b) $(CH_3)_3NH$
c) R_3CNO_2
d) RCH_2NO_2

52) Temporary hardness of water is due to the presence of
a) magnesium bicarbonate
b) calcium chloride
c) magnesium sulphate
d) calcium carbonate

53) Anhydride of sulphuric acid is
a) SO_2
b) SO_3
c) $H_2S_2O_3$
d) H_2SO_3

54) In the castner-kellner cell used for the manufacture of NaOH, the cathode in the central compartment is made of
a) iron
b) carbon
c) mercury
d) steel vessel

55) Rinmann's green is
a) $Co(AlO_2)_2$ b) $ZnO.CoO$ c) Pb_3O_4 d) $MgZnO_4$

56) Railway wagon axles made by heating rods of iron embedded in charcoal powder. This process is known as
a) Annealing   b) Tempering   c) Case-hardening   d) Sherardizing

57) Oxidation number of iron in $K_4[Fe(CN)_6]$ is
a) +2   b) +3   c) +4   d) +1

58) Which of the following has the least bond angle?
a) H_2S b) H_2O c) NH_3 d) CH_4

59) The magnetic quantum number represents:
a) size of the orbital   b) spin angular momentum
c) orbital angular momentum   d) spatial orientation of orbital

60) Electronegativity values for the elements help in predicting:
a) polarity of bonds   b) dipole moments
c) valency of elements   d) position in the electrochemical series

Section-B (2 marks)

Read the following passages and answer the questions given below (61-64):

The coconut is an unusual food for many reasons. It is technically a seed, produced by the coconut palm tree, and as such is one of the largest edible seeds produced by any plant. Its unusual contents also make it unique in the seed world—the interior consists of both "meat" and "water." The meat is the white pith with which we are all familiar, as it is used extensively for cooking and flavorings; the coconut water is a white liquid that is very sweet and thirst-quenching.

Portuguese explorers gave the nut its name in the 15th century, referring to it as coco, meaning "ghost" in their language. The three dimples and the hairy texture reminded them of a ghost's face, and the tree has retained that name ever since.

The coconut has many varied uses. It is used to make margarine, as well as various cooking oils, and these cooking oils are used by fast-food restaurants around the world to make such diet staples as French fries. The coconut fluid is a favorite drink in hot climates, providing a cool and refreshing beverage right off the tree. This water is also used by manufacturers of various sports drinks because of its isotonic electrolyte properties. Even the shell itself has many uses, including cattle food and fertilizer.

Yet the coconut is also useful in many ways that have nothing to do with food. Coconut oil is used for cosmetics, medicines, and can even be used in place of diesel fuel. Dried coconut shells are used in many countries as a tool, such as a buffer for shining wood floors. The shells are also used for shirt buttons, and are commonly found 88 501 Reading Comprehension Questions89 on Hawaiian clothing. They are even used for musical instruments and bird houses!

And all these are only some of the uses found for the coconut fruit. The coconut palm tree, which produces the nut, also produces countless useful items. It's no wonder that the coconut palm has been called "the tree of life."

61) The coconut earned the nickname 'ghost' because:
a) of its pale colour   b) it resembles a face
c) it is round   d) of its smell

62) The main focus of this passage is:
a) the history of coconuts   b) coconut trees have many uses
c) how cooking oil is made   d) Portuguese discoveries

63) Which of the following is NOT a use for the coconut palm?
a) margarine   b) buttons
c) helium balloons   d) diesel fuel

64) The underlined word 'staples', as used in the passage, most nearly means:
a) fasteners   b) plans   c) paperwork   d) foods

65) Train A which is 120 m long is running with velocity 20 m/s while train B which is 130 m long is running in opposite direction with velocity 30 m/s. The time taken by train B to cross the train A is:
a) 5 s   b) 25 s   c) 10 s   d) 100 s

66) A block moving initially with a velocity of 10 m/s on a rough horizontal surface, comes to rest after covering a distance of 50 m. If $g = 10 \, m/s^2$, the coefficient of dynamic friction between the block and the surface is:
a) 0.1   b) 0.2   c) 0.5   d) 1

67) A bomb of 12 kg at rest explodes into two pieces of masses 4 kg and 8 kg. The velocity of 8 kg mass is 6 m/s. Then kinetic energy of 4 kg mass is:
a) 24 J   b) 48 J   c) 288 J   d) 384 J

68) The time period of a simple pendulum of length L at a place where acceleration due to gravity is g is T. What is the period of simple pendulum of the same length at a place where the acceleration due to gravity is 1.02 g?
a) T   b) 1.02 T   c) 0.99 T   d) 1.01 T

69) Water is flowing through a tube of non-uniform cross-section. If the radius of the tube at the entrance and exit is 3:2, then the ratio of velocity of liquid entering and leaving the tube is:
a) 8:27   b) 4:9   c) 9:4   d) 1:1

70) A liquid of mass m and specific heat c is heated to a temperature θ. Another liquid of mass m/2 and specific heat 2c is heated to a temperature 2θ. If these liquids are mixed, the temperature of mixture will be:
a) $\theta/3$ b) $2\theta/3$ c) $3\theta/2$ d) $8\theta/5$

71) At 27°C, the kinetic energy of an ideal gas is E_1. If the temperature is increases to 327°C, the kinetic energy would be:
a) $2E_1$ b) $E_1/2$ c) $\sqrt{2}E_1$ d) $E_1/\sqrt{2}$

72) A lens forms an image on a screen placed at a distance 50 cm from an object. When the lens is shifted towards the screen by 10 cm, another image is formed on the screen. The focal length of the lens is:
a) 5 cm   b) 7 cm   c) 9 cm   d) 12 cm

73) A person can see objects only at a distances more than 40 cm. He is advised to use lens of power:
a) -2.5 D   b) +2.5 D   c) -6.25 D   d) +1.5 D

74) When a sound wave of frequency 300 Hz passes through a medium, the maximum displacement of a particle of the medium is 0.1 cm. The maximum velocity of the particle is equal to:
a) 60 π cm/s   b) 30 π cm/s   c) 30 cm/s   d) 60 cm/s

75) There is an electric field in X-direction. If the work done in moving a charge of 0.2 C through a distance of 2 metres along the line making an angle of 60° with X-direction is 4 Joule, then the value of E is:
a) $\sqrt{2}$ N/C   b) 4 N/C   c) 5 N/C   d) 20 N/C

76) A potentiometer wire is 10 m long. It has a resistance 20Ω. If it is connected in series with a battery of e.m.f. 3 V and negligible internal resistance of 10Ω. The potential gradient along the wire in volt/metre is:
a) 0.02   b) 0.1   c) 0.2   d) 1.2

77) If the bar magnet of magnetic moment M is freely suspended in a uniform magnetic field of strength B. The work done in rotating the magnet through an angle θ is:
a) MB (1-sin θ)   b) MB sin θ c) MB cos θ d) MB (1-cos θ)

78) The binding energy per nucleon of deuterium and helium nuclei are 1.1 MeV and 7.0 MeV respectively. When two deuterium nuclei fuse to form a helium nucleus, the energy released in the fusion is:
a) 23.6 MeV   b) 2.2 MeV   c) 28.0 MeV   d) 30.2 MeV

79) The value of $\lim\limits_{x \to \frac{\pi}{2}} \dfrac{x - \cos(\sin^{-1} x)}{1 - \tan(\sin^{-1} x)}$ is:
a) $-\dfrac{1}{\sqrt{2}}$ b) $\dfrac{1}{\sqrt{2}}$ c) $\sqrt{2}$ d) $-\sqrt{2}$

80) If $y = a \sin x + b \cos x$, then $y^2 + \left(\frac{dy}{dx}\right)^2$ is a:
   a) function of x   b) function of y
   c) function of x and y   d) constant

81) In a triangle ABC, if $\angle C = 60°$, then, $\frac{a}{b+c} + \frac{b}{c+a}$ is equal to:
   a) 1   b) 3/2   c) 1/2   d) $1/\sqrt{2}$

82) The general value of θ satisfying the equation $2\sin^2\theta - 3\sin\theta - 2 = 0$ is:
   a) $n\pi + (-1)^n \frac{\pi}{6}$ b) $n\pi + (-1)^n \frac{\pi}{2}$
   c) $n\pi + (-1)^n \frac{5\pi}{6}$ d) $n\pi + (-1)^n \frac{7\pi}{6}$

83) Two measurements of a cylinder are varying in such a way that the volume is kept constant. If the rates of change of radius (r) and height (h) are equal in magnitude but opposite in sign, then:
   a) $r = 2h$ b) $h = 2r$
   c) $h = r$ d) $h = 4r$

84) $\int \frac{\sqrt{\tan x}}{2\sin x.\cos x} dx =$
   a) $\sqrt{\tan x} + c$ b) $2\sqrt{\tan x} + c$
   c) $\frac{1}{2}\sqrt{\tan x} + c$ d) $4\sqrt{\tan x} + c$

85) The area bounded by $y = \log x, x - axis$ and the straight line $x = e$ is:
   a) e   b) 1   c) $1 - \frac{1}{e}$ d) $1 + \frac{1}{e}$

86) The 13th term in the expansion of $\left(x^2 + \frac{2}{x}\right)^n$ is independent of x, then the sum of divisors of n is:
   a) 36   b) 37   c) 38   d) 39

87) $\log 2 - \frac{\log 4}{2^2} + \frac{\log 8}{3^2} - \frac{\log 16}{4^2} + \cdots =$
   a) $\log 2$ b) $(\log 2)^2$ c) $\log 4$ d) $(\log 4)^2$

88) The amplitude of $\sin\frac{\pi}{5} + i\left(1 - \cos\frac{\pi}{5}\right)$ is:
   a) $\frac{2\pi}{5}$ b) $\frac{\pi}{5}$ c) $\frac{\pi}{15}$ d) $\frac{\pi}{10}$

89) The domain of $f(x) = \sqrt{\log\left(\frac{5x-x^2}{4}\right)}$ is:
   a) $[0,4]$ b) $[1,\infty]$ c) $[-\infty,4]$ d) $[1,4]$

90) The vertices of a triangle are $(6,0), (0,6)$ and $(6,6)$. The distance between the circumcentre and centroid is:
   a) $2\sqrt{2}$ b) 2   c) $\sqrt{2}$ d) 1

91) The extremities of a diameter of a circle have co-ordinates (-4, 3) and (12, -1). The length of the intercept which the circle makes on y-axis is:
   a) $\sqrt{13}$ b) $2\sqrt{13}$ c) $3\sqrt{13}$ d) $4\sqrt{13}$

92) If the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{100} - \frac{4y^2}{225} = 1$ have the same directrices, then the value of b^2 is:
   a) 9   b) 144   c) 12   d) 4

93) If a plane intersects 2, -8, 6 intercepts on co-ordinate axes, then its distance from point (2, -3, 1) is:
   a) 13   b) $\sqrt{13}$ c) 1   d) 5

94) In the following sequence of reactions, $CH_3CH = CHCH_3 \xrightarrow{O_3} A \xrightarrow{Zn\ dust, H_2O} B$. The compound B is:
   a) CH₃CHO   b) CH₃COOH   c) CH₃COCH₃   d) CH₃CH₂CHO

95) Hybridization of C₂ and C₃ of $H_3C - CH = C = CH - H_3C$ are:
   a) sp, sp³   b) sp², sp   c) sp², sp²   d) sp, sp

96) The molarity of a solution obtained by mixing 750 mL of 0.5 M HCl with 250 mL of 2 M HCl will be:
   a) 0.875 M   b) 1.00 M   c) 1.75 M   d) 0.975 M

97) $x\,MnO_4^- + y\,H_2O_2 \rightarrow 2\,Mn^{2+} + 5H_2O + 9O_2 + z\,e^-$. In this reaction, the values of x, y and z are:
   a) 2, 5, 6   b) 5, 2, 9   c) 3, 5, 5   d) 2, 6, 6

98) A current strength of 3.86 ampere was passed through molten calcium oxide for 41 minutes and 40 seconds. The mass of calcium in grams deposited at the cathode is:
   a) 4   b) 2   c) 6   d) 8

99) The species $Ar, K^+\ and\ Ca^{2+}$ contain the same number of electrons. In which order do their radii increase?
   a) $Ar < K^+ < Ca^{2+}$ b) $Ca^{2+} < Ar < K^+$
   c) $Ca^{2+} < K^+ < Ar$ d) $K^+ < Ar < Ca^{2+}$

100) What is the pH of the resulting solution when equal volumes of 0.1 M NaOH and 0.01 M HCl are mixed?
   a) 12.65   b) 2.0   c) 7.0   d) 1.04

Thank You!!!!!!