INSTITUTE OF ENGINEERING

MODEL ENTRANCE EXAM

(Beats Test Series - Day 5)

Instructions:

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

Date : 2081/05/06
(August 22)

Duration : 2 hours
Time : 8 A.M. – 10 A.M.

SECTION – A (1 marks) (1*60 = 60)

1) Often a team of engineers _____ on one project.
   a) works
   b) work
   c) are working
   d) have worked

2) His tooth needs _____.
   a) filling
   b) to be filled
   c) to fill
   d) to filling

3) She _____ the novel by tomorrow.
   a) will be completing
   b) has completed
   c) had completed
   d) will have completed

4) We'd be terribly offended if he _____.
   a) didn't come
   b) hadn't have come
   c) wouldn't come
   d) wouldn't have come

5) I am _____ doubt about his arrival.
   a) in
   b) on
   c) at
   d) by

6) Congestion (Antonym):
   a) uncrowned
   b) obstruction
   c) saturated
   d) lamed

7) Sanguine (Synonym):
   a) speculation
   b) pessimistic
   c) menacing
   d) elated

8) Convert the following into indirect speech: "She said to him, 'Where did you buy this beautiful dress?'"
   a) She asked him where did he buy that beautiful dress.
   b) She asked him where he had bought that beautiful dress.
   c) She asked him where he has bought this beautiful dress.
   d) She asked him where he bought that beautiful dress.

9) The idiom "Break the ice" means:
   a) To cause harm
   b) To initiate conversation
   c) To break something fragile
   d) To be in a difficult situation

10) Identify the word that starts with the same vowel phoneme as 'ear':
    a) air
    b) iron
    c) eel
    d) early

11) In the word 'syllabification', the primary stress falls on which syllable?
    a) first
    b) second
    c) third
    d) fourth

12) The correct complex sentence form of the given sentence "He is too tired to walk." is:
    a) He is very tired but still can walk.
    b) He is so tired that he cannot walk.
    c) He is tired because he walked too much.
    d) He is so tired and he will walk later

13) Which of the following contains more molecules?
    a) 1 g CO_2
    b) 1 g N_2
    c) 1 g H_2
    d) 1 g CH_4

14) If uncertainty in the position of an electron is zero, the uncertainty in its momentum would be:
    a) zero
    b) $\geq \frac{h}{4\pi}$
    c) $< \frac{h}{4\pi}$
    d) infinite

15) In O_2 and H_2O_2, the O-O bond length is 1.21 and 1.48 Å respectively. In ozone, the average $O - O$ bond length is:
    a) 1.28 Å
    b) 1.18 Å
    c) 1.4 Å
    d) 1.52 Å

16) In which of the following cases, reaction is spontaneous at all temperature?
    a) $\Delta H > 0; \Delta S > 0$
    b) $\Delta H < 0; \Delta S > 0$
    c) $\Delta H < 0; \Delta S < 0$
    d) $\Delta H < 0; \Delta S = 0$

17) Acidity of BF_3 can be explained on the basis of which of the following concept?
    a) Arrhenius concept
    b) Bronsted-Lowry concept
    c) Lewis concept
    d) Bronsted-Lowry concept as well as Lewis concept

18) In a tetragonal crystal:
    a) $a = b = c; \alpha = \beta = 90° \neq \gamma$
    b) $a = b \neq c; \alpha = \beta = \gamma = 90°$
    c) $a \neq b \neq c; \alpha = \beta = \gamma = 90°$
    d) $a = b \neq c; \alpha = \beta = 90°, \gamma = 120°$

19) Which of the following compound is used for water softening?
    a) $Ca_3(PO_4)_2$
    b) Na_3PO_4
    c) $Na_6P_6O_{18}$
    d) Na_2HPO_4

20) Metals form basic hydroxides. Which of the following metal hydroxide is least basic?
a) $Mg(OH)_2$ b) $Ca(OH)_2$ c) $Sr(OH)_2$ d) $Ba(OH)_2$

21) The alkali metals have low melting point. Which of the following alkali metal is expected to melt if the room temperature raises to 30°C?
a) Na   b) K   c) Li   d) Cs

22) Diamond is hard because:
a) all the 4 valence electrons are bonded to each carbon atom by covalent bonds.
b) it is a giant molecule
c) it is made up of carbon atom
d) it cannot be burnt.

23) Which of the following is not a coinage metal?
a) Copper   b) Silver   c) Gold   d) Iron

25) The IUPAC name for $CH_3 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_2 - \overset{\overset{O}{\|}}{C} - OH$ is:
a) 1-hydroxy pentane-1,4-dione   b) 1, 4-dioxo pentanal
c) 1-carboxy butan-3-one   d) 4-oxo pentanoic acid

25) The fragrance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is:
a) distillation   b) crystallization
c) distillation under reduced pressure   d) steam distillation

26) Reduction of carbonyl compounds with Zn-Hg in presence of conc. HCl gives alkane. The reaction is called as:
a) Sabatier Sendersen's reaction   b) Clemmensen's reduction
c) Wolf Kishner's reduction   d) Frankland reaction

27) The dimensional formula for Young's modulus is:
a) $[M^2L^2T^{-2}]$ b) $[M^2LT^{-2}]$ c) $[MT^{-2}]$ d) $[MLT^{-2}]$

28) Consider an elevator moving downwards with an acceleration a, the force exerted by passenger of mass m on the floor of the elevator is:
a) ma   b) ma – mg   c) mg – ma   d) mg + ma

29) The radius of gyration of a uniform rod of length L about an axis passing through its centre of mass is:
a) $\frac{L}{2\sqrt{3}}$ b) $\frac{L^2}{12}$ c) $\frac{L}{\sqrt{3}}$ d) $\frac{L}{\sqrt{2}}$

30) The excess pressure due to surface tension in a spherical liquid drop of radius r is directly proportional to:
a) r   b) r^2 c) r^{-1} d) r^{-2}

31) The absolute zero temperature in Fahrenheit scale is:
a) -273°F   b) -32°F   c) -460°F   d) -132°F

32) A given system undergoes a change in which the work done by the system equals the decrease in its internal energy. The system must have undergone an:
a) isothermal change   b) adiabatic change
c) isobaric change   d) isochoric change

33) A string of length l fixed at both the ends is vibrating in two segments. The wavelength of the corresponding wave is:
a) l/4   b) l/2   c) l   d) 2l

34) Electric field intensity at a point in between two parallel sheets with like charges of same surface charge densities (σ) is:
a) $\frac{\sigma}{2\varepsilon_0}$ b) $\frac{\sigma}{\varepsilon_0}$ c) zero   d) $\frac{2\sigma}{\varepsilon_0}$

35) The only property possessed by ferromagnetic substance is:
a) hysteresis   b) susceptibility
c) directional property   d) attracting magnetic substances

36) If a current of 10 A changes in one second through a coil, and the induced emf is 10 V, then the self-inductance of the coil is:
a) 2/5 H   b) 4/5 H   c) 5/4 H   d) 1 H

37)   A piece of plane glass is placed on a word with letters of different colours. The letters which appear
        minimum raised are:
        a) red   b) green   c) yellow   d) violet
38)   Huygens wave theory of light cannot explain:
        a) diffraction   b) interference   c) polarization   d) photoelectric effect
39)   The minimum wavelength of X-rays produced by electrons accelerated by a potential difference of V
        volt is equal to:
        a) $\frac{eV}{hc}$ b) $\frac{eh}{cV}$ c) $\frac{hc}{eV}$ d) $\frac{cV}{eh}$
40)   A transistor has three impurity regions. All the three regions have different doping levels. In order of
        increasing doping level, the regions are:
        a) emitter, base and collector   b) collector, base and emitter
        c) base, emitter and collector   d) base, collector and emitter
41)   The maximum value of the function $\sin x + \cos x$ is
        a) 1   b) 2   c) $\sqrt{2}$ d) 1/2
42)   If $\sin^{-1} x = \frac{\pi}{5}$, then $\cos^{-1} x$ is equal to
        a) $\frac{\pi}{10}$ b) $\frac{3\pi}{10}$ c) $\frac{\pi}{2}$ d) $\frac{7\pi}{10}$
43)   The general value of x if $\cos^2 x = \frac{1}{4}$ is
        a) $n\pi + \frac{\pi}{3}$ b) $n\pi \pm \frac{2\pi}{3}$ c) $n\pi \pm \frac{\pi}{3}$ d) $2n\pi \pm \frac{\pi}{3}$
44)   The vectors $\vec{a} = 5\hat{\imath} + 4\hat{\jmath}$ and $\vec{b} = -20\hat{\imath} - 60\hat{\jmath}$ are
        a) coincident   b) parallel
        c) perpendicular   d) neither parallel nor perpendicular
45) $\lim\limits_{x \to 0} \frac{\sin 7x}{\sin 5x} =$
        a) 7/5   b) 5/7   c) 0   d) ∞
46)   If $y = \tan^{-1} x$ and $z = \cot^{-1} x$, then $\frac{dy}{dz} =$
        a) $\sqrt{1 + x^2}$ b) 1   c) $\frac{1}{1+x^2}$ d) –1
47) $\int \frac{1}{x\log x} dx =$
        a) $\log x + c$ b) $\log\log x + c$ c) $\log x^2 + c$ d) $2\log x + c$
48)   The function $y = x^3 + 3x^2 - 9x + 25$ has point of inflection at
        a) x = -2   b) x = 3   c) x = 1/2   d) x = -1
49)   If the line ax+4y=5 makes an intercept 3 units on X-axis, then the value of a is
        a) 3/5   b) 4/5   c) 5/3   d) 5/4
50)   The value of k for which $x^2 - kxy + 4y^2 = 0$ represents a pair of coincident lines is
        a) k=1   b) k=2   c) k=3   d) k=4
51)   The circle $x^2 + y^2 - 2\lambda x - 2\lambda y + \lambda^2 = 0, \lambda \neq 0$
        a) passes through origin   b) touches x-axis
        c) touches y-axis   d) touches both axes
52)   The eccentricity of the parabola $y^2 - 4x + 6y - 27 = 0$ is
        a) 4   b) -1   c) 0   d) 1
53)   If α, β, γ are direction angles of AB, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$
        a) 0   b) 1   c) 2   d) -1
54)   The sum of squares of deviations of 10 observations taken from their mean 50 is 250. Its coefficient of
        variance is:
        a) 10   b) 25   c) 50   d) 5
55) $A - (B \cap C) =$
        a) $(A - B) \cap (A - C)$ b) $(A \cap B) - C$
        c) $(A \cup B) - C$ d) $(A - B) \cup (A - C)$
56)   The domain of the function $f(x) = \frac{x^2+1}{(x-1)}$ is
        a) R   b) $R - \{1\}$ c) $R - \{0\}$ d) $\{-1,1\}$

57) The complex number $\frac{1+2i}{1-i}$ lies in
a) first quadrant   b) second quadrant   c) third quadrant   d) fourth quadrant
58) The sum of three numbers of G.P. is 38 and their product is 1728. Then the middle term is
a) 12   b) 8   c) 18   d) 6
59) $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{pmatrix}$ is a/an
a) identity matrix   b) symmetric matrix
c) triangular matrix   d) diagonal matrix
60) If two roots of the equation $ax^2 + bx + c = 0$ be equal in magnitude but opposite in sign, then
a) $a = 0$ b) $b = 0$ c) $ab = 0$ d) $c = 0$

SECTION – B (2 marks) (2*40=80)

Read the following passage and answer the questions given below (61-64):
As the rulers of the planet, humans like to think that it is the large creatures who will emerge victorious from the struggle for survival. However, nature teaches us the opposite it is often the smallest species which are the toughest and most adaptable. A perfect example is the hummingbird, which is found in the Americas. One species of hummingbird is known as the bee hummingbird ranks as the world's smallest and lightest bird and it is barely visible when it is in flight.
Humming birds are the only birds that can fly backwards. They feed mainly on the nectar of flowers, a liquid that is rich in energy. Nectar is an ideal food source, for hummingbirds need an incredible amount of energy to sustain their body metabolism. A hummingbird's wings flap at a rate of about 80 times per second and its tiny heart beats more then 1000 times per minute. This is why they must consume relatively large quantities of food. In the course of a day, a hummingbird consumes about half its body weight in nectar.
61) Nature has made man realize the fact that:
a) the large creatures emerge victorious from the struggle for survival
b) the smallest creatures are the toughest and most adaptable
c) humans who rule the planet are the most powerful beings on Earth
d) the largest and the smallest species are equally tough and strong
62) Which of the following statements about the bee hummingbird is true?
a) It is obviously visible when it flies   b) It escapes our sight when it is in flight
c) It could fly high beyond the clouds   d) It cannot be seen when it is in flight
63) Hummingbirds need a lot of energy in order to
a) maintain their body metabolism   b) flap their wings and fly backwards
c) sustain a steady rhythm of heart-beat   d) win in the struggle for survival
64) The hummingbirds are exclusive in the sense that
a) they subsist only on nectar
b) their pulse rate is more than 1000 per minute
c) they consume half their body weight everyday
d) they can fly backwards
65) The amount of silver (atomic mass = 108) deposited from a solution of silver nitrate when a current of 965 Coulombs was passed is:
a) 10.8 g   b) 0.108 g   c) 1.08 g   d) 1.08×10^3 g
66) For a reaction, A + B → Products, the rate of reaction at various concentrations are given below;

Experiment No.	[A]	[B]	Rate (mol dm^{-3} s^{-1})
1	0.2	0.2	2
2	0.2	0.4	4
3	0.6	0.4	36

The rate law for the above reaction is:
a) $r = k[A]^2[B]$ b) $r = k[A][B]^2$
c) $r = k[A]^3[B]$ d) $r = k[A]^2[B]^2$

67) 2.5 litre of 1 M NaOH solution are mixed with another 3 litre of 0.5 M NaOH solution. Then, the molarity of the resulting solution is:
a) 0.8 M   b) 0.1 M   c) 0.73 M   d) 0.5 M

68) Which of the following elements does not show disproportionation reaction?
a) Cl   b) Br   c) F   d) I

69) The correct order of ionization energy of C, N, O and F is:
a) $F < N < C < O$ b) $C < N < O < F$
c) $C < O < N < F$ d) $F < O < N < C$

70) Which one of the following is not in accordance with the properties?
a) HI > HBr > HCl > HF; Acidic property in water
b) $F_2 > Cl_2 > Br_2 > I_2$; Electronegativity
c) $F_2 > Cl_2 > Br_2 > I_2$; Bond dissociation energy
d) $F_2 > Cl_2 > Br_2 > I_2$; Oxidizing power

71) $CH_3 - CH = CH - CH_3 \xrightarrow{O_3} A \xrightarrow{H_2O/Zn} B \xrightarrow{dil.NaOH} C$. Here, C is:
a) CH_3CHO b) $CH_3 - \overset{OH}{\underset{|}{CH}} - CH_2 - CHO$
c) $CH_3 - \overset{O}{\overset{\|}{C}} - CH_3$ d) $(CH_3)_2 - \overset{OH}{\underset{|}{C}} - CH_2 - \overset{O}{\overset{\|}{C}} - CH_3$

72) The correct order of basic strength among amines (I), ammonia (II), aniline (III) and benzylamine (IV) is:
a) I > II > III > IV   b) I > II > IV > III
c) I > IV > II > III   d) IV > I > II > III

73) A particle starts from rest, accelerates at 2 m/s^2 for 10s and then goes for constant speed for 30s and then decelerates at 4 m/s^2 till it stops. What is the distance travelled by it?
a) 750 m   b) 800 m   c) 700 m   d) 850 m

74) A sphere is suspended by a thread of length l. What minimum horizontal velocity has to be imparted to the ball for it to reach the height of the suspension?
a) $\sqrt{5gl}$ b) 2gl   c) $\sqrt{gl}$ d) $\sqrt{2gl}$

75) A body is projected vertically upwards from the surface of earth with a velocity equal to half the escape velocity. If R be the radius of earth, maximum height attained by the body from the surface of the earth is:
a) R/6   b) R/3   c) 2R/3   d) R

76) A wooden block of mass 8 kg is tied to a string attached to the bottom of the tank. In the equilibrium the block is completely immersed in water. If relative density of wood is 0.8 and g = 10 m/s^2 , then tension T in the string is:
a) 120 N   b) 100 N   c) 80 N   d) 20 N

77) An ideal gas at a pressure of 1 atm and temperature of 27°C is compressed adiabatically until its pressure becomes 8 times the initial pressure, then the final temperature is ($\gamma = 3/2$):
a) 627°C   b) 527°C   c) 427°C   d) 327°C

78) A liquid of mass m and specific heat c is heated to a temperature 2T. Another liquid of mass m/2 and specific heat 2c is heated to a temperature T. If these two liquids are mixed, the resulting temperature of the mixture is:
a) 2/3 T   b) 8/5 T   c) 3/5 T   d) 3/2 T

79) What is the phase difference, at a given instant of time, between two particles 25 m apart, when the wave y(x, t) = 0.03 sin π (2t − 0.01x) travels in a medium?
a) π/8   b) π/4   c) π/2   d) π

80) Two condensers of capacity 0.3 µF and 0.6 µF respectively are connected in series. The combination is connected across a potential of 6 V. The ratio of energies stored by the condensers will be:
a) 1/2   b) 2   c) 1/4   d) 4

81) For two resistance wires joined in parallel, the resultant resistance is 6/5 Ω. When one of the resistance wire breaks, the effective resistance becomes 2 Ω. Resistance of the broken wire is:
a) 3/5 Ω   b) 2 Ω   c) 6/5 Ω   d) 3 Ω

82) In a series L-C-R circuit, the voltage across resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited, the voltage across the inductance will be:
a) $10/\sqrt{2}$ V   b) 10 V   c) $10\sqrt{2}$ V   d) 20 V

83) The real image which is exactly equal to the size of an object is to be obtained on a screen with the help of a convex lens of focal length 15 cm. For this, what must be in the distance between the object and screen?
a) 15 cm   b) 30 cm   c) 45 cm   d) 60 cm

84) In Young's double slit experiment green light ($\lambda = 5461\text{Å}$) is used and 60 fringes were seen in the field view. Now sodium light is used ($\lambda = 5890$ Å), then number of fringes observed are:
a) 40   b) 60   c) 50   d) 55

85) When radiation is incident on photoelectron emitter, the stopping potential is found to be 9 V. If e/m for the electron is 1.8×10^{11} Ckg^{-1}, the maximum velocity of the ejected electrons is:
a) 6×10^5 m/s   b) 8×10^5 m/s c) 1.8×10^6 m/s   d) 1.8×10^5 m/s

86) If α, β are the roots of the equation $ax^2 + bx + c = 0$, then the value of $\alpha^3 + \beta^3 =$
a) $\frac{3abc+b^3}{a^3}$
b) $\frac{a^3+b^3}{3abc}$
c) $\frac{3abc-b^3}{a^3}$
d) $\frac{a^3-b^3}{3abc}$

87) In the expansion of $\frac{(1+x+x^2)}{e^x}$, the coefficient of x^2 is:
a) 1   b) -1   c) 1/2   d) -1/2

88) A card is chosen at random from a standard deck of 52 playing cards. Without replacing it, a second card is chosen. The probability that the first card chosen is a queen and the second card chosen is a Jack is:
a) $\frac{1}{169}$ b) $\frac{4}{663}$ c) $\frac{1}{52}$ d) $\frac{1}{13}$

89) The value of $\begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} =$
a) $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$
b) $2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$
c) $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}^2$
d) $\begin{vmatrix} a^2 & b^2 & c^2 \\ p & q & r \\ x^2 & y^2 & z^2 \end{vmatrix}$

90) Among 14 football players, 5 are defenders. In how many ways a team of 11 can be formed with at least 4 defenders?
a) 312   b) 264   c) 420   d) 512

91) If $\tan\left(\frac{\pi}{4} + \theta\right) + \tan\left(\frac{\pi}{4} - \theta\right) = 4$, then the general values of $\theta =$
a) $n\pi \pm \frac{\pi}{3}$
b) $n\pi \pm \frac{\pi}{6}$
c) $n\pi \pm \frac{\pi}{4}$
d) $2n\pi + \frac{\pi}{4}$

92) The sum of slopes of the lines represented by $4x^2 + 2hxy - 7y^2 = 0$ is equal to the product of slopes, then h is equal to:
a) -4   b) 4   c) -6   d) -2

93) The line $y = x + a\sqrt{2}$ touches the circle $x^2 + y^2 = a^2$ at the point:
a) $\left(\frac{a}{\sqrt{2}}, \frac{a}{\sqrt{2}}\right)$
b) $\left(-\frac{a}{\sqrt{2}}, -\frac{a}{\sqrt{2}}\right)$
c) $\left(\frac{a}{\sqrt{2}}, -\frac{a}{\sqrt{3}}\right)$
d) $\left(-\frac{a}{\sqrt{2}}, \frac{a}{\sqrt{2}}\right)$

94) In the ellipse, minor axis is 8 and the eccentricity is $\frac{\sqrt{5}}{3}$, then major axis is:
a) 6   b) 12   c) 10   d) 16

95) The area lying in the first quadrant and bounded by the curve $y = x^3$ and the line $y = 4x$ is:
a) 4 sq. units   b) 8 sq. units   c) 16 sq. units   d) 64 sq. units

96) Let $g(x) = f(x) - 1$. If $f(x) + f(1 - x) = 2 \ \forall \ x \in R$, then $g(x)$ is symmetrical about:

a) the origin

b) the line $x = \frac{1}{2}$

c) the point $(1,0)$

d) the point $\left(\frac{1}{2}, 0\right)$

97) $\lim\limits_{x \to 1} \frac{1-x^2}{\sin 2\pi x}$ is equal to:

a) $\frac{1}{2\pi}$

b) $-\frac{1}{\pi}$

c) $-\frac{2}{\pi}$

d) $-\pi$

98) If $(\sin x)(\cos y) = 1/2$, then $\frac{d^2 y}{dx^2}$ at $(\pi/4, \pi/4)$ is:

a) -4

b) -2

c) -6

d) 0

99) If $f(x) = \frac{t+3x-x^2}{x-4}$, where t is a parameter that has a minimum and maximum, then the range of values of t is:

a) (0,4)

b) (0,∞)

c) (-∞,4)

d) (4,∞)

100) $\int \frac{e^x}{\sqrt{4-e^{2x}}} dx =$

a) $\sin^{-1}(e^x) + c$

b) $\cos^{-1}(e^x) + c$

c) $\sin^{-1}\left(\frac{e^x}{2}\right) + c$

d) $\cos^{-1}\left(\frac{e^x}{2}\right) + c$

❖❖❖❖ **Thank You!!!** ❖❖❖❖