INSTITUTE OF ENGINEERING

MODEL ENTRANCE EXAM

(Beats Test Series - Day 2)

Instructions:

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

Date : 2081/05/02
(August 18)

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

SECTION – A (1 marks) (1*60 = 60)

1) The phonetic symbol /ɔː/ represents which vowel sound?
   a) The vowel in "cot" b) The vowel in "caught"
   c) The vowel in "cut" d) The vowel in "cat"
2) Which sentence has the correct word stress pattern?
   a) The 'contract is signed by the parties. b) The con'tract is signed by the parties.
   c) The con'tract is signed by the par'ties. d) The 'contract is signed by the par'ties.
3) If I _____ about the event, I would have attended it.
   a) know b) knew c) had known d) will know
4) He said, "I will call you when I arrive."
   a) He said that he will call me when he arrives.
   b) He said that he would call me when he arrived.
   c) He said that he would call me when he arrives.
   d) He said that he will call me when he arrived.
5) Transform the following sentence into a negative form: "She can sing well."
   a) She can't sing well. b) She couldn't sing well.
   c) She didn't sing well. d) She can't singing well.
6) Identify the correct passive voice form for the sentence: "The committee is reviewing the proposal."
   a) The proposal was reviewed by the committee.
   b) The proposal is reviewed by the committee.
   c) The proposal is being reviewed by the committee.
   d) The proposal reviewed by the committee.
7) I would like _____ to the new restaurant tonight.
   a) to go b) going c) go d) went
8) Select the correctly punctuated sentence.
   a) The book, which was on the table is missing.
   b) The book which was on the table, is missing.
   c) The book which was on the table is missing.
   d) The book, which was on the table, is missing.
9) He was accused _____ stealing the money.
   a) with b) for c) of d) about
10) If someone is "in the same boat" as you, what does it imply?
   a) They are in a difficult or challenging situation as well
   b) They are in agreement with you
   c) They are traveling with you
   d) They are ahead of you in a competition
11) Coherent (Antonym):
   a) Logical b) Consistent c) Disjointed d) Rational
12) Effervescent (Synonym):
   a) Flat b) Boring c) Lively d) Still
13) The truth value of the statement "if $(1 + 2i)^2$ is a complex number, then 4 is the real part" is:
   a) F b) T c) T or F d) F and T
14) If $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then the value of A^9 is:
   a) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ b) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ c) $\begin{pmatrix} i & 0 \\ 0 & i \end{pmatrix}$ d) $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$
15) The value of $\frac{a+b\omega+c\omega^2}{a\omega+b\omega^2+c}$ is:
   a) 1 b) ω c) ω^2 d) 0

16) If α, β are the roots $x^2 + px + q = 0$, then the value of $\alpha^3 + \beta^3$ is:
a) $3pq + p^3$ b) $3pq - q^3$ c) $3pq$ d) $p^3 - 3pq$

17) The value of $x^{1/2}.x^{1/4}.x^{1/8} \ldots \infty$ is:
a) x b) x^2 c) $1/x$ d) x^3

18) In how many ways 3 letters can be posted in 4 letter boxes?
a) 56 b) 64 c) 76 d) 81

19) The general solution of $\tan 3x = 1$ is:
a) $n\pi + \frac{\pi}{4}$ b) $\frac{n\pi}{3} + \frac{\pi}{12}$ c) $n\pi$ d) $n\pi \pm \frac{\pi}{4}$

20) The value of $\sin(\cot^{-1} x)$ is:
a) $\sqrt{1-x^2}$ b) x c) $(1+x^2)^{-3/2}$ d) $(1+x^2)^{-1/2}$

21) The angles of a triangle is in the ratio $1:2:3$. Then the sides are:
a) $1:2:\sqrt{3}$ b) $1:\sqrt{2}:\sqrt{3}$ c) $1:\sqrt{3}:2$ d) $1:2:\sqrt{3}$

22) If three line $3x - y = 2, 5x + ay = 3$ and $2x + y = 3$ are concurrent, then the value of a is:
a) 2 b) 3 c) -1 d) -2

23) The equation $x^2 + y^2 + 2x + 4y + k = 0$ represent a real circle if:
a) $k < 5$ b) $k = 5$ c) $k > 5$ d) $k = 1$

24) Equation of the line joining the foci of the parabola $y^2 = 4x$ and $x^2 = -4y$ is:
a) $x + y - 1 = 0$ b) $x - y - 1 = 0$ c) $x - y + 1 = 0$ d) $x + y + 1 = 0$

25) Equation of a directrix of the ellipse $\frac{x^2}{36} + \frac{y^2}{4} = 1$ is:
a) $9x - 8 = 0$ b) $8x - 9 = 0$
c) $\sqrt{2}x + 9 = 0$ d) $x + 9\sqrt{2} = 0$

26) The length of the perpendicular from the point (2, 3, 4) on the plane $3x - 4y + 5z + 2 = 0$ is:
a) $\frac{2\sqrt{2}}{3}$ b) $\frac{8\sqrt{2}}{5}$ c) $6\sqrt{3}$ d) 4

27) The probaility of not getting black from a bag containing 9 red, 7 white and 4 black is:
a) 4/20 b) 4/5 c) 7/19 d) 3/5

28) $\lim_{x\to\infty} \frac{\sin x}{x} =$
a) 0 b) 1 c) -1 d) does not exist

29) The minimum value of $x^2 + 4x + 5$ is:
a) 1 b) 0 c) -1 d) 2

30) $\int_1^0 xe^x dx =$
a) $e^2 - 1$ b) $\frac{e+1}{2}$ c) -1 d) 1

31) Solution of the differential equation $xdy - ydx = 0$ represents a:
a) circle b) parabola c) hyperbola d) straight line

32) If $|\vec{a}| = 2, |\vec{b}| = 5$ and $|\vec{a} \times \vec{b}| = 8$, then $|\vec{a}.\vec{b}|$ is equal to:
a) 4 b) 6 c) 8 d) 10

33) The correct dimensional formula for impulse is:
a) ML^2T^{-2} b) MLT^{-1} c) ML^2T^{-1} d) MLT^{-2}

34) Which of the following remains constant for a projectile fired from the earth?
a) kinetic energy b) momentum
c) horozontal component of velocity d) vertical component of velocity

35) With what minimum acceleration can a fireman slide down a rope whose breaking strength is 40% of his weight?
a) (1/5) g b) (2/5) g c) (3/5) g d) (4/5) g

36) The surface energy of a drop of water of radius r is proportional to:
a) r^3 b) r^2 c) r d) $1/r$

37) The presence of gravitational field is required for the heat transfer by:
a) conduction b) stirring of liquids
c) natural convection d) radiation

38) At absolute temperature, the translational kinetic energy of the molecules:
a) becomes zero b) becomes maximum
c) becomes minimum d) remains constant

39) There is no net transfer of energy by particles of medium in:
a) longitudinal wave b) transverse wave
c) progressive wave d) stationary wave

40) The intensity of electric field between the plates of a charged condenser having charge q and an area A will be:
a) qA/ε_0 b) $q/\varepsilon_0 A$ c) $A/q\varepsilon_0$ d) $\varepsilon_0 A/q$

41) A charged particle is moving along a magnetic field line. The magnetic force on the particle is:
a) along its velocity b) opposite to its velocity
c) perpendicular to its velocity d) zero

42) If 'N' is the number of turns in a circular coil, then the value of self inductance varies as:
a) N^0 b) N c) N^2 d) N^{-2}

43) Critical angle of light passing from glass to air is minimum for:
a) red colour b) green colour c) yellow colour d) blue colour

44) A spherical air bubble in water behaves as:
a) convex lens b) concave lens c) concave mirror d) plane mirror

45) Which of the following transitions in hydrogen atoms emit photons of highest frequency?
a) $n = 1$ to $n = 2$ b) $n = 2$ to $n = 6$ c) $n = 6$ to $n = 2$ d) $n = 2$ to $n = 1$

46) The electrical conductivity of p-type semiconductor is determined by the number of:
a) free electrons in the conduction band b) electrons in the valence band
c) holes d) impurity atoms alone

47) When an electrons jump from lower to higher orbit, the energy:
a) increase b) decreases c) remains same d) not definite

48) The bond angle formed by different hybrid orbitals are in the order:
a) $sp^2 > sp^3 > sp$ b) $sp^3 > sp^2 > sp$
c) $sp^3 > sp > sp^2$ d) $sp > sp^2 > sp^3$

49) Oxidation state of chlorine in perchloric acid is:
a) -1 b) 0 c) -7 d) +7

50) Which of the following is not an example of molecular crystal?
a) Hydrogen b) Iodine c) Ice d) Sodium chloride

51) Which of the following is correct for the reaction, $N_2\ (g) + 3H_2(g) \rightleftharpoons 2NH_3\ (g)$?
a) $K_p > K_c$ b) $K_p < K_c$
c) $K_p = K_c$ d) Pressure is required to predict the corelation

52) Which one of the following is always not negative?
a) Enthalpy of combustion b) Enthalpy of formation
c) Enthalpy of neutralization d) Lattice enthalpy

53) Which of the following elements has maximum electron affinity?
a) F b) Cl c) Br d) I

54) The metal used to recover copper from a solution of $CuSO_4$ is:
a) Na b) Fe c) Hg d) Ag

55) When sodium is treated with sufficient oxygen/air, the product formed is:
a) Na_2O b) Na_2O_2 c) NaO_2 d) NaO

56) Bell metal is an alloy of:
a) Cu + Zn b) Cu + Ni c) Cu + Sn d) Cu + Pb

57) The product fomed when ozone reacts with mercury is:
a) HgO b) Hg_2O_2 c) Hg_2O d) HgO_2

58) The best method for the separation of naphthalene and benzoic acid from their mixture is:
a) chromatography b) crystallization c) distillation d) sublimation

59) Phenol on distilling with Zn dust gives:
a) benzene b) toluene c) zinc phenoxide d) acetylene

60) The compound that does not undergo Hell Volard Zelinsky (HVZ) reaction is:
a) acetic acid b) trichloroacetic acid
c) isobutyric acid d) propionic acid

SECTION – B (2 marks) (2*40=80)

61) The range of the function $f(x) = \frac{2x}{3x+4}$ is:
a) $R - \{0\}$ b) $\{0, \infty)$ c) $R - \{2/3\}$ d) $\{-1, 1\}$

62) The value of the determinant $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$ is:
a) -2 b) 2 c) 4 d) 0

63) If 21^{st} and 22^{nd} term in the expansion of $(1+x)^{44}$ are equal, then the value of x is:
a) 3/2 b) 6 c) 7/8 d) 1/2

64) $e^{(1+x)-\frac{1}{2}(1+x)^2+\frac{1}{3}(1+x)^3-\frac{1}{4}(1+x)^4+\cdots} =$
a) $\log(1+x)$ b) $\log x$ c) x d) $2+x$

65) $\tan^2(\sec^{-1} 2) + \cot^2(\text{cosec}^{-1} 3)$ is:
a) 13 b) 15 c) 11 d) 20

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

67) The number of common tangents to the circle $x^2 + y^2 = 16$ and $x^2 + y^2 - 2y = 0$ is:
a) 1 b) 2 c) 3 d) 0

68) If e_1 and e_2 are the eccentricities of the hyperbola $2x^2 - 2y^2 = 1$ and the ellipse $x^2 + 2y^2 = 2$ respectively. Then:
a) $e_1 + e_2 = 1$ b) $e_1 . e_2 = 1$
c) ${e_1}^2 + {e_2}^2 = 1$ d) $e_1 = e_2/2$

69) If a line makes angles 45˚ and 60˚ with x-axis and y-axis, then the angle made by the line with z-axis is:
a) 60˚ or 120˚ b) 45˚ or 135˚ c) 30˚ or 150˚ d) 90˚or 180˚

70) If $\vec{a} = (4, 3)$ and $\vec{b} = (-2, -3)$, then the unit vectors of $\vec{a} + 2\vec{b}$ is:
a) (0, 1) b) (0, -1) c) (1, 0) d) (-1, 0)

71) If mode of a data exceeds its mean by 12, then mode exceeds the median by:
a) 4 b) 8 c) 6 d) 10

72) $\lim_{x \to 0} \frac{a^x - b^x}{x}$ is equal to:
a) $\log ab$ b) $\log \frac{a}{b}$ c) $\frac{\log a}{\log b}$ d) $\frac{\log b}{\log a}$

73) If $y = x^x$, then $\frac{dy}{dx} =$
a) $\log x$ b) $2 + \log x$ c) $x^x \log x$ d) $x^x(1 + \log x)$

74) The value of $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ is:
a) $\sqrt{1-x^2} \sin^{-1} x + c$ b) $x \sin^{-1} x + c$
c) $x - \sqrt{1-x^2} \sin^{-1} x + c$ d) $(\sin^{-1} x)^2 + c$

75) The area of the region between the curve $y = x^3$ and the line $y = x$ lying in the first quadrant is:
a) 1/4 b) 1/2 c) 1 d) 2

76) A ball is thrown vertically upwards with a velocity of 30 m/s. If the acceleration due to gravity is 10 m/s^2, the distance travelled by it in the last second of motion is:
a) 5 m b) 10 m c) 25 m d) 30 m

77) A small object of uniform density rolls up a curved surface with velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is:
a) hollow sphere b) disc c) ring d) solid sphere

78) A body weighs 200 N on the surface of the earth. How mich will it weigh half way down to the centre of earth?
a) 150 N b) 200 N c) 250 N d) 100 N

79) A wooden cube floats just inside the water when a mass of 300 g is placed on it. If the mass is removed, the cube floats with 3 cm above the water surface. The length of the side of cube is:
a) 10 cm b) 15 cm c) 20 cm d) 30 cm

80) 20 gms of ice and 20 gms of hot water are mixed. When the ice melted, the temperature of the mixture was found to be 0°C. The temperature of hot water taken should be ($L_{ice} = 80$ cal/gm):
a) 40°C b) 72°C c) 80°C d) 96°C

81) A carnot's engine operates with source at 127°C and sink at 27°C. If the source supplies 40 kJ of heat energy, the work done by the engine is:
a) 30 kJ b) 10 kJ c) 4 kJ d) 1 kJ

82) An open resonating tube has fundamental frequency of n. When half of its length is dipped into water, then its fundamental frequency will be:
a) 3n/2 b) n/2 c) 2n d) n

83) Two small charged spheres A and B have charges 10 μC and 40 μC respectively and are held at a separation of 90 cm from each other. At what distance from A, electric intensity would be zero?
a) 22.5 cm b) 18 cm c) 36 cm d) 30 cm

84) A 4 m long wire of resistance 8 Ω is connected in series with a battery of emf 2 V and a resistor of 7 Ω. The internal resistance of the battery is 1 Ω. The potential gradient along the wire is:
a) 0.25 Vm^{-1} b) 0.50 Vm^{-1} c) 0.75 Vm^{-1} d) 1.00 Vm^{-1}

85) In series RCL circuit, the reactance of inductor as well as capacitor is 10 Ω. If the resistance in the circuit be 10 Ω and 100 V power supply is connected across it, then the current in the circuit is:
a) 5 A b) 10 A c) 15 A d) 25 A

86) A glass slab ($\mu = 1.5$) of thickness 3.0 cm is placed on an ink spot. A person looks at it from a distance 5.0 cm above the ink spot. The distance of the spot will appear to be:
a) 5.0 cm b) 4.5 cm c) 4.0 cm d) 3.5 cm

87) Two beams of light of intensities 4I and I interfere. The intensity on the screen, where the phase difference is $\pi/2$, will be:
a) 5I b) 6I c) 8I d) 9I

88) The threshold wavelength of a metal surface is 600 nm. The wavelength of the incident light is 450 nm. The maximum kinetic energy of the incident photon will be:
a) 0.3 eV b) 0.6 eV c) 0.9 eV d) 1.2 eV

89) Volume of a gas at NTP is 1.12×10^{-7} cc. The number of molecules in it is:
a) 3.1×10^{20} b) 3.01×10^{12} c) 30.1×10^{23} d) 3.01×10^{24}

90) The weight of oxalic acid that will be required to prepare a 1000 mL (N/20) solution is:
a) 126/100 g b) 63/40 g c) 63/20 g d) 126/20 g

91) The rate of a first order reaction is 1.5×10^{-2} $molL^{-1}min^{-1}$ at 0.5 M concentration of the reactant. The half life of the reaction is:
a) 7.53 min b) 0.383 min c) 23.1 min d) 8.73 min

92) If ${E^0}_{Fe^{2+}/Fe} = -0.441\ V$ and ${E^0}_{Fe^{3+}/Fe^{2+}} = +0.771\ V$, the standard emf of the reaction $Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$ will be:
a) 1.653 V b) 1.212 V c) 0.111 V d) 0.330 V

93) Laughing gas is prepared by heating:
a) NH_4Cl b) $(NH_4)_2SO_4$
c) $NH_4Cl + NaNO_3$ d) NH_4NO_2

94) When Cl_2 is passed through hot and conc. caustic soda, the mixture of the following substance is produced:
a) NaCl and sodium chlorate b) Sodium hypochlorite and bleaching powder
c) NaCl and sodium hypochlorite d) NaCl and bleaching powder

95) The IUPAC name of the compound $CH_3CH(OH)CH = C(CH_3)CHO$ is:
a) 4-hydroxy-1-methyl pentanal b) 2-hydroxy-4-methyl pent-3-en-5-ol
c) 4-hydroxy-2-methyl pent-2-enal d) 2-hydroxy-4-methyl pent-2-enol

96) Identify the product 'C' in the following reaction:
$C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow{NaNO_2+HCl,273\ K} B \xrightarrow{H_2O,283\ K} C$
a) $C_6H_5CH_2OH$ b) C_6H_5OH
c) C_6H_5CHO d) $C_6H_5NH_2$

Read the following passage and answer the questions given below (97-100).
It is strange that, according to his position in life, an extravagant man is admired or despised. A successful businessman does nothing to increase his popularity by being careful with his money. He is expected to display his success, to have a smart car, an expensive life, and to be lavish with his hospitality. If he is not so, he is considered mean and his reputation in business may even suffer in consequence. The paradox remains that if had not been careful with his money in the first place, he would never have achieved his present wealth. Among the low-income group, a different set of values exists. The young clerk who makes his wife a present of a new dress when he hadn't paid his house rent, is condemned as extravagant. Carefulness with money to the point of meanness is applauded as a virtue. Nothing in his life is considered more worthy into joyless little piles-so much for rent, for food, for the children's shoes; she is able to face the milkman with equanimity and never knows the guilt of buying something she can't really afford. As for myself, I fall into neither of these categories, if I have money to spare, I can be extravagant, but when, as is usually the case, I am hard up, then I am the meanest man imaginable.

97) In the opinion of the writer, a successful businessman:
a) is more popular if he appears to be doing nothing
b) should not bother about his popularity
c) must be extravagant before achieving success
d) is expected to have expensive tastes

98) The phrase 'lavish with his hospitality' signifies:
a) miserliness in dealing with his friends
b) considerateness in spending on guests and strangers
c) extravagance in entertaining guests
d) indifference in treating his friends and relatives

99) It seems that low paid people should:
a) not pay their bills promptly
b) not keep their creditors waiting
c) borrow money to meet their essential needs
d) feel guilty if they overspend

100) How does the housewife, described by the writer, feel when she saves money?
a) is content to be so thrifty.
b) wishes life were less burdensome.
c) is still troubled by a sense of guilt.
d) wishes she could sometimes be extravagant.

❖❖❖❖ Thank You!!! ❖❖❖❖