INSTITUTE OF ENGINEERING

MODEL ENTRANCE EXAM

(Beats Test Series - Day 1)

Instructions:

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

Date : 2081/05/01
(August 17)

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

SECTION – A (1 marks) (1*60 = 60)

1) Each mark on the exam _____ a difference to his total score on the test.
a) makes b) are making c) make d) have made

2) The doctor recommended _____ the medicine.
a) to take b) took c) taking d) to taking

3) The plane _____ for Pokhara tomorrow.
a) is leaving b) left c) was leaving d) leaves

4) If you heat water, _____.
a) it would boil b) it could boil c) it boils d) it boiled

5) He did that _____ purpose.
a) in b) on c) at d) with

6) 'To be left out in the cold' means:
a) to be in charge b) to make matters worse
c) to be ignored d) to be inconsistent

7) Transform the following sentence into a complex sentence.
"She finished her work and left."
a) She left after finishing her work. b) After finishing her work, she left.
c) When she finished her work, she left. d) She left and finished her work.

8) Select the one which best expresses the given sentence into Passive / Active voice.
"These kinds of stories are written by Swastik."
a) Swastik can write these kinds of stories.
b) Swastik write these kinds of stories.
c) Swastik has written these kinds of stories.
d) Swastik writes these kinds of stories.

9) Confront (Synonym):
a) defy b) evade c) flee d) surmise

10) Rookie (Antonym):
a) novice b) amateur c) professional d) cub

11) Identify the phoneme that represents the vowel sound in the word "seat":
a) /I/ b) /i:/ c) /e/ d) /æ/

12) In the word "international," which syllable carries the primary stress?
a) first b) second c) third d) fourth

13) Set A has 4 elements and set B has 7 elements. The, the minimum number of elements in $\{A \cup B\}$ is:
a) 3 b) 6 c) 9 d) 7

14) If $A = \begin{bmatrix} -i & 0 \\ 0 & i \end{bmatrix}$, then $A'A$ is equal to:
a) I b) -iA c) -I d) iA

15) Evaluate $(i)^{n+4}$, where 'i' is imaginary unit.
a) i b) -1 c) i^n d) $-i^n$

16) The value of the expression $\sqrt{6+\sqrt{6+\sqrt{6+\cdots}}} + \infty$ is:
a) 1, 0 b) 2, 1
c) 3, 1 d) 3, -2

17) A campus has 5 gates. In how many ways can a man enter the campus through one gate and come out through a different gate?
a) 5 b) 25 c) 20 d) 40

18) The coefficient of x^8 in the expansion $(1+x^2)^{10}$ is:
a) 20 b) 80 c) 45 d) 54

19) The equation $2\cos^2\theta + 3\sin\theta = 0$ has a solution$(\pi \le \theta \le 2\pi)$:
a) $\pi/6$ b) $2\pi/3$ c) $5\pi/3$ d) $7\pi/6$

20) The value of $\sin\left\{3\sin^{-1}\left(\frac{2}{5}\right)\right\}$ is:
a) 118/125 b) 64/27 c) 256/125 d) 27/8

21) In an equilateral triangle, R and r are connected by:
a) $R = 2r$ b) $r = 2R$ c) $R = 3r$ d) $R = 1/r$

22) If (3, 3) lies on the line joining the points (h, 0) and (0, k), then:
a) $h + k = 9$ b) $\frac{1}{h} + \frac{1}{k} = \frac{1}{3}$ c) $hk = 3$ d) $3h - 3k = 1$

23) The angle between the line pair $x^2 + 7xy - y^2 = 0$ is:
a) 60° b) 135° c) 75° d) 90°

24) The eccentricity of the ellipse if the latus rectum is half of its major axis is:
a) $e = \frac{1}{4}$ b) $e = \frac{2}{3}$ c) $e = \frac{1}{\sqrt{2}}$ d) $e = \frac{2}{\sqrt{3}}$

25) The latus rectum of the hyperbola $16x^2 - 9y^2 = 144$ is:
a) 16/3 b) 15/4 c) 8/3 d) 32/3

26) The ratio in which line joining the points (2, -3, 1) and (3, -4, -5) is divided by the plane $2x + y + z = 7$ is:
a) 1:1 b) -1:2 c) 2:3 d) 4:5

27) If $y = a\sin(5x + c)$, then:
a) $\frac{dy}{dx} = 5y$ b) $\frac{dy}{dx} = -5y$
c) $\frac{d^2y}{dx^2} = -25y$ d) $\frac{d^2y}{dx^2} = 25y$

28) For what value of m, are the two vectors, $\vec{a} = \left(\vec{\imath} - 2\vec{\jmath} + 3\vec{k}\right)$ and $\vec{b} = \left(2\vec{\imath} + 7\vec{\jmath} + m\vec{k}\right)$ orthogonal?
a) $m = 3$ b) $m = 5$ c) $m = 2$ d) $m = 4$

29) If the first quartile and third quartile of an individual series is 23 and 33. Find the quartile deviation.
a) 20 b) 5 c) 60 d) 3

30) The value of $\lim_{x\to a} \frac{\sqrt[3]{x} - \sqrt[3]{a}}{\sqrt{x} - \sqrt{a}}$ is:
a) $\frac{2}{3a^{1/3}}$ b) $\frac{3}{2a^{1/3}}$
c) $\frac{2}{3a^{1/6}}$ d) $\frac{3}{2a^{1/6}}$

31) If $x^2 + y^2 = 4$, then $\frac{dy}{dx} =$
a) y/x b) $-y/x$ c) $-x/y$ d) x/y

32) $\frac{\sin^4 x}{\cos^6 x}dx =$
a) $\frac{1}{5}\tan^5 x + c$ b) $\frac{1}{3}\tan^3 x + c$
c) $\frac{(\sec x.\tan x)^5}{5} + c$ d) $\sec^{5/2} x + c$

33) The correct IUPAC name for compound $HCONHCH_2CH_3$ is:
a) N-formyl aminoethane b) N-ethyl formyl amine
c) N-ethyl methanamide d) ethyl amino methanal

34) The addition of HCN to a carbonyl compound is an example of:
a) nucleophilic substitution reaction b) electrophilic addition reaction
c) nucleophilic addition reaction d) electrophilic substitution reaction

35) Acetamide reacts with NaOBr in alkaline medium to form:
a) NH_3 b) CH_3NH_2
c) CH_3CN d) $CH_3CH_2NH_2$

36) The number of g-atoms of oxygen in 6.02×10^{24} CO molecule is:
a) 1 b) 0.5 c) 5 d) 10

37) The two electrons in an orbital have different:
a) principal quantum number b) azimuthal quantum number
c) magnetic quantum number d) spin quantum number

38) An element which never has positive oxidation number in any of its compounds is:
a) Boron b) Oxygen
c) Chlorine d) Fluorine

39) Potassium crystallizes in a bcc lattice, hence the coordination number of potassium in potassium metal is:
a) 0 b) 4 c) 6 d) 8

40) A reaction involving two different reactants can never be:
a) unimolecular reaction b) first order reaction
c) second order reaction d) bimolecular reaction

41) The reaction $Zn^{2+} + 2e^- \rightarrow Zn$ has a standard potential of -0.76 V. This means:
a) Zn can't replace hydrogen from acids b) Zn is a reducing agent
c) Zn is an oxidizing agent d) Zn^{2+} is a reducing agent

42) Which of the following ions has the smallest radius?
a) Be^{2+} b) Li^+ c) O^{2-} d) F^-

43) The chemical formula for zeolite is:
a) $K_2Al_2SiO_8.xH_2O$ b) $CaAl_2Si_2O_8$
c) $Na_2Al_2Si_2O_8.xH_2O$ d) $Na_2[Na_4(PO_3)_6]$

44) Heating of pyrites in air for oxidation of sulphur is called:
a) roasting b) smelting c) calcination d) slagging

45) Which of the following attacks glass?
a) HCl b) HF c) HI d) HBr

46) In the extraction of silver, Ag_2S is dissolved in:
a) HCl b) HNO_3
c) KCN d) H_2SO_4

47) The x-component of a vector making an angle of 30° with horizontal is 3. Its y-component is:
a) 3 b) $\sqrt{3}/2$
c) $3/\sqrt{2}$ d) $\sqrt{3}$

48) The most appropriate material for making a cooking pot is one having:
a) low specific heat and high conductivity b) low specific heat and low conductivity
c) high specific heat and low conductivity d) high specific heat and high conductivity

49) The velocity of sound in air is independent of change in:
a) pressure b) density
c) temperature d) humidity

50) When light passes through glass slab:
a) wavelength decreases b) wavelength increases
c) velocity increases d) frequency decreases

51) When a dielectric slab is introduced in parallel plate capacitor, then:
a) electric field intensity doesn't change
b) electric field intensity decreases
c) electric field intensity increases
d) electric field intensity depends upon thickness of slab

52) If two streams of protons move parallel to each other in the same direction, then these:
a) do not interact at all b) attract each other
c) repel each other d) deflect perpendicular to the plane of streams

53) Hydrogen atom does not emit X-ray because:
a) its energy levels are too close to each other
b) its energy levels are too far to each other
c) it is too small
d) it has single electron

54) Balls are thrown at different angles with the speed u from same point having same range for two angles θ_1 and θ_2. The maximum height attained are h_1 and h_2. Then $h_1 + h_2$ is:
a) $\frac{u^2}{g}$ b) $\frac{2u^2}{g}$ c) $\frac{u^2}{2g}$ d) $\frac{u^2}{4g}$

55) The period of satellite in an orbit of radius R is T. The period of another satellite in an orbit of radius 4R will be:
a) 4T b) T/8 c) 8T d) 16T

56) A transparent cube of side 15 cm contains a small air bubble. The apparent depth is 6 cm from the face and 4 cm from opposite face. Then, refractive index of glass is:
a) 2 b) 2.5 c) 1.6 d) 1.5

57) Two waves $y_1 = 4\sin 100\pi t$ and $y_2 = 3\cos 100\pi t$ superimpose. The amplitude of resultant wave will be:
a) 1 unit b) 5 units c) 7 units d) 9 units

58_ When 64 drops of mercury of potential 'v' merge, then the potential of single drop will be:
a) v b) 8v c) 16v d) 64v

59) Three 2 Ω resistors are placed along in triangle, them resistance across any side will be:
a) 6 Ω b) 2 Ω c) 3/4 Ω d) 4/3 Ω

60) Doubly ionized helium atom and hydrogen ions are accelerated from rest, through the same potential difference. The ratio of final velocities of helium and hydrogen is:
a) $1:\sqrt{2}$ b) $\sqrt{2}:1$ c) $1:2$ d) $2:1$

SECTION – B (2 marks) (2*40=80)

61) The domain of the function $f(x) = \frac{1}{\sqrt{x^2-5x+6}}$ is:
a) $(-\infty, 3)$ b) $(-\infty, 1) \cup (2, \infty)$
c) $(-\infty, 2) \cup (3, \infty)$ d) $(3, \infty)$

62) $\begin{vmatrix} xp+y & x & y \\ yp+z & y & z \\ 0 & xp+y & yp+z \end{vmatrix} = 0$ if:
a) x, y, z are in A.P. b) x, y, z are in GP
c) x, y, z are in HP d) xy, yz, zx are in AP

63) The sum of the 1^{st} n natural numbers are 1/5 times the sum of their squares. Then the value of n is:
a) 5 b) 6 c) 7 d) 8

64) The sum of the series $\frac{1}{1.2} + \frac{1}{3.4} + \frac{1}{5.6} + \cdots \infty$ is:
a) $\log_e 2$ b) $1 - \log_e 2$ c) e^x d) a^x

65) In ΔABC, if $a + b = 3c$, then the value of $\cot\frac{A}{2}\cot\frac{B}{2}$ is:
a) 1 b) 2 c) 3 d) 4

66) Two numbers are randomly selected from the first 100 natural numbers. The probability that the product of the numbers is divisible by 7 is:
a) 0 b) 1/14
c) 4859/4950 d) 91/4950

67) Which of the following second degree equation represented a pair of straight lines?
a) $x^2 - xy - y^2 = 1$ b) $-x^2 + xy - y^2 = 1$
c) $4x^2 - 4xy + y^2 = 4$ d) $x^2 + y^2 = 4$

68) If the circles $x^2 + y^2 - 9 = 0$ and $x^2 + y^2 + 2ax + 2y + 1 = 0$ touch each other externally, then the value of a is:
a) -4/3 b) 1 c) 3/4 d) 1/3

69) If the normal at the point $P(at^2, 2at)$ of the parabola $y^2 = 4ax$ meets it again at $(at_1{}^2, 2at_1)$, then $t_1 =$
a) -1/t b) 1/t c) $t + \frac{2}{t}$ d) $-t - \frac{2}{t}$

70) The equation of plane perpendicular to $5x + 3y + 6z + 8 = 0$ and which passes through intersection of planes $x + 2y + 3z - 4 = 0$ and $2x + y - z + 5 = 0$ is:
a) $51x + 15y + 8z + 173 = 0$ b) $51x + 15y - 8z + 173 = 0$
c) $51x - 5y - 8z - 173 = 0$ d) $51x - 15y + 8z - 173 = 0$

71) Angle between two vectors $\sqrt{3}(\vec{a} \times \vec{b})$ and $\vec{b} - (\vec{a}.\vec{b})\vec{a}$ is:
a) $\pi/3$ b) $\pi/4$ c) $\pi/6$ d) $\pi/2$

72) The value of $\lim_{x \to 0^+} x^x$ is:
a) 1 b) 0 c) e d) not defined

73) The differential coefficient of $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ w.r.t. $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is:
a) 1 b) -1 c) 1/2 d) 2

74) $\int_0^2 \frac{1-x}{1+x} dx =$
a) $2\log 3 - 2$ b) $3 - 2\log 2$
c) $\sqrt{2}\log 2 - 2$ d) $2\log 2 + 2$

75) The area of the rectangle bounded by $|x| = 2$, the x-axis and $y = 1$ is (in square unit):
a) 2 b) 3 c) 4 d) 6

76) An organic compound A reacts with methyl magnesium iodide to form an addition product, which on hydrolysis forms the compound B. B gives blue colour salt in Victor Meyer's test. The compound A and B are respectively:
a) acetaldehyde, tertiary butyl alcohol b) acetaldehyde, ethyl alcohol
c) acetaldehyde, isopropyl alcohol d) acetone, isopropyl alcohol

77) In the reaction, $CH_3COOH \xrightarrow{Li/AlH_4} A \xrightarrow{PCl_5} B \xrightarrow{alc.KOH} C$. The product 'C' is:
a) acetaldehyde b) acetylene c) ethylene d) acetyl chloride

78) The enthalpy change (ΔH) for the reaction, $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ is -92.38 kJ at 298 K. The change in internal energy (ΔU) at 298 K is:
a) -92.38 kJ b) -87.42 kJ
c) -97.34 kJ d) -89.9 kJ

79) The pH of a 0.1 M solution of the acid HQ is 3. The value of ionization constant K_α of the acid is:
a) 3×10^{-1} b) 1×10^{-3}
c) 1×10^{-5} d) 1×10^{-7}

80) 50 mL of hydrogen diffuses out through a small hole from a vessel in 20 minute, time needed for 40 mL of oxygen to diffuse out is:
a) 12 minute b) 64 minute
c) 8 minute d) 32 minute

81) How much of NaOH is required to neutralize 1500 cm^3 of 0.1 N HCl?
a) 4 gm b) 6 gm c) 40 gm d) 60 gm

82) The product formed when phosphorous trioxide is dissolved in water is:
a) HPO_3 b) H_3PO_4 c) H_3PO_3 d) HPO_2

83) The correct sequence of increasing covalent character is represented by:
a) $BeCl_2 < NaCl < LiCl$ b) $NaCl < LiCl < BeCl_2$
c) $BeCl_2 < LiCl < NaCl$ d) $LiCl < NaCl < BeCl_2$

84) A car accelerated from rest at constant rate for the first 10 seconds and covers a distance x. It covers a distance y in the next 10 seconds at the same acceleration. Which of the relation is true?
a) $y = 3x$ b) $x = 3y$ c) $x = y$ d) $y = 2x$

85) A rope of length l is pulled by a constant force F. The tension in the rope at a distance x from the end where force is applied is:
a) $F\frac{l}{x}$ b) $F\frac{l}{l-x}$
c) $F\frac{x}{l-x}$ d) $F\frac{l-x}{l}$

86) Two capillaries of same diameter are dipped into liquids of specific gravity 0.4 and 0.8 respectively. If their surface tensions are in the ratio 6:5, then the ratio of heights of liquids in them will be:
a) 12:5 b) 5:12 c) 1:2 d) 2:1

87) The coefficient of cubical expansion of brass and iron are $54 \times 10^{-6}\ °C^{-1}$ and $36 \times 10^{-6}\ °C^{-1}$ respectively. If brass and iron rods show the same difference in length at all temperatures, their lengths are in the ratio of:
a) 3:2 b) 2:3 c) 9:4 d) 4:9

88) A piano wire of diameter 0.9 mm is replaced by another wire of 0.93 mm, then the percentage change in frequency of piano wire is:
a) +3.0 % b) +3.2 % c) -3.0 % d) -3.2 %

89) A vessel of depth 't' is half filled with water of refractive index μ_1 and the other half is filled with a liquid of refractive index μ_2. The apparent depth of vessel as seen from above is:
a) $\frac{2\mu_1\mu_2}{\mu_1+\mu_2}$ b) $\frac{\mu_1\mu_2}{(\mu_1+\mu_2)}$
c) $\frac{t(\mu_1+\mu_2)}{2\mu_1\mu_2}$ d) $\frac{2t(\mu_1+\mu_2)}{\mu_1\mu_2}$

90) A parallel beam of white light falls on a convex lens. Images of blue, yellow and red light are formed on the other side of the lens at distance 20 cm, 20.5 cm and 21.4 cm respectively. The dispersive power of the material of the lens is:
a) 619/1000 b) 9/200 c) 14/205 d) 5/214

91) Identical charges -q each are placed at 8 corners of a cube of each side b. Electrostatic potential energy of charge +q which is placed at the centre of cube will be:
a) $-\frac{4\sqrt{2}q^2}{\pi\varepsilon_0 b}$ b) $-\frac{8\sqrt{2}q^2}{\pi\varepsilon_0 b}$
c) $-\frac{4q^2}{\sqrt{3}\pi\varepsilon_0 b}$ d) $\frac{8\sqrt{2}q^2}{4\pi\varepsilon_0 b}$

92) Masses of three wires of same material are in the ratio of 1:2:3 and their lengths are in the ratio of 3:2:1. Electrical resistance of these wires will be in the ratio of:
a) 1:1:1 b) 1:2:3 c) 9:4:1 d) 27:6:1

93) In order to light a 6 W – 6 V bulb at rated power, a battery of emf 6 V and internal resistance 2 Ω is used. The bulb will light at power:
a) 6 W b) 27/8 W c) 4 W d) 16/3 W

94) A galvanometer of resistance 10 Ω gives a full scale deflection when a current of 0.04 A is passed through it. It is desired to convert it into ammeter reading 10 A in a full scale. The only shunt available is 0.06 Ω. The resistance that must be connected in series with the coil of the galvanometer is:
a) 14.94 Ω b) 9.88 Ω c) 4.94 Ω d) 2.47 Ω

95) The energy that should be added to an electron to reduce its de-Broglie wavelength from 10^{-10} m to 0.5×10^{-10} m is:
a) twice initial energy b) thrice initial energy
c) four times initial energy d) equal to initial energy

96) ${}_{87}Ra^{221}$ undergoes radioactive decay with a half life of 4 days. The fraction of sample decay in 8 days is:
a) 1/4 b) 1/2 c) 4/3 d) 3/4

Read the following passage and answer the questions given below (97-100).
Because goldfish can be kept easily in small ponds and aquariums, they make good pets, but like many other pets, they must have proper care and the right kind of place to live.
A two-inch fish requires a minimum of two gallons of water containing sufficient oxygen to support life. Some oxygen will make its way into the water of an aquarium from the air that touches the surface. Plants in an aquarium also help to furnish oxygen. Snails help to keep an aquarium clean. Thus, with plenty of plants and snail, the water in an aquarium does not have to be changed frequently. A large lake may prove to be a quite unsuitable abode for goldfish.
It is important that goldfish should not be overfed. They can be fed such things as dried insects in addition to commercially prepared goldfish good, but they should not be given more food that can be consumed in about five minutes. This ensures prolonged life.

97) Which of the following statements is true?
a) Goldfish should be given food only once a day.
b) Snails eat up the goldfish in an aquarium.
c) Plants provide food to the snails.
d) Goldfish comes above the surface of water to get oxygen from air.

98) Which of the following helps supply goldfish with oxygen?
a) Snails b) Plants c) Dried insects d) Aquarium

99) Water in an aquarium needs to be changed if ……
a) there are plenty of snails and plants in it.
b) there is no sufficient oxygen in it.
c) it is very clean and contains sufficient oxygen.
d) it does not contain goldfish food and dried insects.

100) What is important to remember when feeding goldfish?
a) they should be fed more than once a day.
b) they should be fed at five-minute intervals.
c) they should be fed with plants and snails.
d) they should be fed only once a day.

❖❖❖❖ Thank You!!! ❖❖❖❖