INSTITUTE OF ENGINEERING

Model Entrance Exam

(Set-9)

Instructions:

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

Date: 2080/04/13
(July-29)

Duration: 2 hours
Time: 8:30 AM – 10:30 AM

Section-A (1 marks)

1) I, together with all my friends in class _____ the right guidance.
a) needs b) is needing c) need d) has needed

2) There's something in the box, _____?
a) isn't it b) is it c) aren't there d) isn't there

3) Before he joined our office in Kathmandu, he _____ for an NGO in Pokhara.
a) worked b) was working c) had worked d) had been working

4) If he _____ earlier, he could have left on the afternoon flight.
a) decided b) had decided
c) would have decided d) will decided

5) There are telephone wires _____ the street.
a) over b) off c) of d) at

6) We have to keep our fingers crossed till the final result is declared.
a) keep praying b) feel suspicious
c) wait expectantly d) feel scared

7) Bondage (Synonym) :
a) liberty b) emancipation c) stipulate d) enslaved

8) Exquisite (Antonym) :
a) elegant b) delicate c) hideous d) dainty

9) The technician said that he would repair the laptop.
a) The technician said, "I will repair the laptop."
b) The technician said, "I would repair the laptop."
c) The technician said, "I should repair the laptop."
d) The technician said, "I can repair the laptop."

10) The word 'communist' has a stress primarily on its _____ syllable.
a) first b) second c) third d) fourth

11) The affirmative form of, "I did not see anyone entering his office." is:
a) I saw someone entering his office. b) I did see anyone entering his office.
c) I see anyone entering his office. d) I did saw someone entering his office.

12) The correct grammatical pattern for the following sentence is:
"The people elected the young candidate governor."
a) Subject + Linking verb + Complement
b) Subject + Verb + Indirect object + Direct object
c) Subject + Verb + Direct object + Object complement
d) Subject + Direct object + Object complement

13) $\lim_{x\to 1}(1-x)\tan\frac{\pi x}{2} =$
a) $\frac{\pi}{2}$ b) $\frac{2}{\pi}$ c) π d) $\frac{1}{\pi}$

14) $\frac{d}{dx}\left(\frac{\cos x}{\sin x+1}\right) =$
a) $\frac{1}{1-\sin x}$ b) $\frac{-1}{\cos x+1}$ c) $\frac{1}{1-\cos x}$ d) $\frac{-1}{\sin x+1}$

15) If $xy = 4$ and $x < 0$, then maximum value of $x + 16y$ is:
a) 8 b) -8 c) 16 d) -16

16) $\int \frac{dx}{x+\sqrt{x}} =$
a) $\log\left(\sqrt{x}+1\right)+c$ b) $\log\left(\sqrt{x}\right)+c$
c) $2\log\left(\sqrt{x}+1\right)+c$ d) $2\log\left(\sqrt{x}\right)+c$

17) The value of k for which the roots of the equation $x^2 - kx + k + 1 = 0$ are in the ratio 2:3 is:
a) $k = 6$ b) $k = -6$ c) $k = 5$ d) $k = -5$

18) $\sum_{n=0}^{\infty} \frac{(log_e x)^{2n}}{(2n)!} =$
a) $\frac{x-x^{-1}}{2}$ b) $\frac{1}{x}+x$ c) $\frac{x+x^{-1}}{2}$ d) $\frac{e^x+e^{-x}}{2}$

19) If $5, x, y, z, 405$ are in G.P., then $z =$
a) 15 b) 45 c) 135 d) 85

20) The conjugate of a complex number is $\frac{1}{i-1}$. Then the complex number is:
a) $\frac{-1}{i-1}$ b) $\frac{1}{i+1}$ c) $\frac{-1}{i+1}$ d) $\frac{1}{i-1}$

21) If matrix A is of order $p \times q$ and matrix B is of order $r \times s$, then $A - B$ will exist if:
a) $p = q$ b) $p = r, q = s$
c) $p = q, r = s$ c) $p = s, q = r$

22) A candidate has to pass in 5 different subjects in an examination. The number of ways in which he may fail is:
a) 30 b) 31 c) 32 d) 33

23) Let f and g be the functions defined by $f(x) = \frac{x}{x+1}$, $g(x) = \frac{x}{1-x}$, then $fog(x)$ is:
a) $\frac{1}{x}$ b) $\frac{1}{x-1}$ c) $x - 1$ d) x

24) $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0$ are equations of three lines. If $a + b + c = 0$, then:
a) lines are concurrent b) lines are parallel to each other
c) all lines are coincident d) they form a triangle

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

26) The line $y = mx + c$ intersects the parabola $y^2 = 4ax$ in two imaginary points if:
a) $\frac{mc}{a} < 1$ b) $\frac{mc}{a} > 1$
c) $\frac{mc}{a} = 1$ d) $\frac{mc}{a} = 0$

27) The vertices of the ellipse $16x^2 + 25y^2 = 400$ is:
a) $(\pm 5, 0)$ b) $(\pm 4, 0)$ c) $(0, \pm 4)$ d) $(0, \pm 5)$

28) The equation of plane passing through the point (1, -1, 2) and making equal intercept on the axes is:
a) $x - y + 2z = 0$ b) $x - y + 2z = 2$
c) $x + y + z = 0$ d) $x + y + z = 2$

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

30) The number of solutions of $sin^2\theta + 3 \cos\theta = 3$ in $[-\pi, \pi]$ is:
a) 4 b) 2 c) 0 d) 1

31) If $\text{cosec}^{-1} x = \sin^{-1} \frac{1}{x}$, then which of the following is not the value of x?
a) $x = -\frac{1}{2}$ b) $x = \frac{3}{2}$ c) $x = -\frac{3}{2}$ d) $x = 1$

32) If θ is the angle between vectors such that $\vec{a}.\vec{b} \geq 0$, then:
a) $0 \leq \theta \leq \pi$ b) $\frac{\pi}{2} \leq \theta \leq \pi$
c) $0 \leq \theta \leq \frac{\pi}{2}$ d) $0 < \theta < \frac{\pi}{2}$

33) In the reaction $C_2O_4{}^{2-} + MnO_4{}^- + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$, the reductant is:
a) $C_2O_4{}^{2-}$ b) $MnO_4{}^-$ c) Mn^{2+} d) H^+

34) Which of the following contains both covalent and coordinate bonds?
a) CO b) CO_2 c) $CaCl_2$ d) C_2H_6

35) Which of the following oxides of nitrogen is called mixed anhydride?
a) NO b) NO_2 c) N_2O_4 d) N_2O_5

36) Sulphuric acid on heating with sulphur powder gives:
a) H_2SO_3 b) SO_3 c) SO_2 and SO_3 d) SO_2

37) Which oxyacid of chlorine is the least oxidizing in nature?
a) $HClO$ b) $HClO_2$ c) $HClO_3$ d) $HClO_4$

38) The element with highest electrical conductivity is:
a) Zn b) Fe c) Cu d) Ag

39) Flame test is not given by:
a) $MgCl_2$ b) $CaCl_2$ c) $SrCl_2$ d) $BaCl_2$

40) When N and S both are present in an organic compound, the sodium extract with $FeCl_3$ gives:
a) green colour b) blue colour c) yellow colour d) red colour

41) Which behaves both as a nucleophile and electrophile?
a) CH_3NH_2 b) CH_3OH c) CH_3CN d) CH_3Cl

42) After electrons are filled in np, electrons are filled in:
a) $(n+1)s$ b) $(n+2)p$
c) $(n+1)d$ d) $(2n+1)d$

43) The normality of a solution containing 6.36 gram of Na_2CO_3 in 600 ml of it is:
a) 0.01 N b) 0.05 N c) 0.1 N d) 0.2 N

44) If C and R denote the capacitance and resistance, then the dimensions of RC are:
a) $[M^0L^0T]$ b) $[M^0L^0T^{-1}]$
c) $[ML^0T^{-2}]$ d) $[M^0L^0T^0]$

45) A man is standing in a lift accelerating upward. Then apparent weight of man is:
a) equal to actual weight b) more than the actual weight
c) less than the actual weight d) zero

46) A body is projected upward. As it rises there is increase in its:
a) momentum b) kinetic energy
c) retardation d) potential energy

47) The force of gravitational attraction on a body is:
a) minimum at the equator
b) minimum at the poles
c) minimum midway between poles and equator
d) same at all point on earth's surface

48) Which one of the following cannot be explained by Bernoulli's theorem?
a) action of atomizer b) curved path followed by a spinning ball
c) equilibrium of ball in a fountain d) rise of liquid in a capillary tube

49) Water in a metal can is completely surrounded with melting ice (pure), which among the following is the only wrong statement?
a) The temperature of water will fall b) The volume of water will decrease slightly
c) Water in the can will soon freeze d) The kinetic energy of its molecules will decrease

50) The work done in an isochoric change:
a) depends on temperature only b) depends on pressure only
c) depends on volume only d) is zero

51) A driver in a swimming pool wants to signal his distress to a person lying on the edge of the pool by flashing his water proof flash light, then he has to:
a) direct the beam vertically upward
b) direct the beam horizontally
c) direct the beam at an angle to the vertical less than the critical angle of incidence
d) direct the beam at an angle to the vertical more than the critical angle of incidence

52) The magnifying power of a telescope can be increased by:
a) increasing focal length of both lenses b) by fitting eye-piece of high power
c) by fitting eye-piece of low power d) by increasing the distance of object

53) For production of beats, the two sources must be:
a) coherent of same frequency b) incoherent of same frequency
c) coherent of slightly different frequencies d) incoherent of slightly different frequencies

54) The electric field intensity at the surface of a charged conductor is:
a) zero b) directed normally to the surface
c) directed tangentially to the surface d) directed along 45˚ to the surface

55) Two bulbs one of 25 W 220 V and another of 100 W, 220 V are connected in series across 220 V mains. The current:
a) through 25 W bulb is more b) through 100 W bulb is more
c) is same in the two bulbs d) is zero in the two bulbs

56) A strong magnetic field is applied on a stationary electron, then the electron:
a) moves in the direction of the field b) moves in an opposite direction of the field
c) remains stationary d) starts spinning

57) In which region of electromagnetic spectrum does the Lyman series of Hydrogen atom lie:
a) Ultraviolet b) Infrared
c) Visible d) Microwave

58) A p-type semiconductor is:
a) a silicon crystal doped with arsenic impurity
b) a silicon crystal doped with antimony impurity
c) a germanium crystal doped with boron impurity
d) a germanium crystal doped with phosphorous impurity

59) Angular momentum of the particle rotating with a central force is constant due to:
a) constant torque b) constant force
c) constant linear momentum d) zero torque

60) A ball of superconducting material is dipped in liquid nitrogen and placed near a bar magnet. In which direction will it move?
a) away from bar magnet b) towards the bar magnet
c) around the bar magnet d) remain constant

Section-B (2 marks)

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

By using tiny probes as neural prostheses, scientists may be able to restore nerve function in quadriplegics and make the blind see or the deaf hear. Thanks to advanced techniques, a single, small, implanted probe can stimulate individual neurons electrically or chemically and then record responses. Preliminary results suggest that the microprobe telemetry systems can be permanently implanted and replace damaged or missing nerves.

The tissue-compatible microprobes represent an advance over the typical aluminum wire electrodes used in studies of the cortex and other brain structures. Researchers accumulate much data using traditional electrodes, but there is a question of how much damage they cause to the nervous system. Microprobes, which are about as thin as a human hair, cause minimal damage and disruption of neurons when inserted into the brain.

In addition to recording nervous-system impulses, the microprobes have minuscule channels that open the way for delivery of drugs, cellular growth factors, neurotransmitters, and other neuroactive compounds to a single neuron or to groups of neurons. Also, patients who lack certain biochemicals could receive doses via prostheses. The probes can have up to four channels, each with its own recording/stimulating electrode.

61) One similar feature of microprobes and wire electrodes is:
a) a minimal disturbance of neurons. b) the density of the material.
c) the capacity for multiple leads. d) their ability to generate information.

62) Which of the following best expresses the main idea of the passage?
a) Microprobes require further techno-logical advances before they can be used in humans.
b) Wire electrodes are antiquated as a means for delivering neuroactive compounds to the brain.
c) Microprobes have great potential to help counteract neural damage.
d) Technology now exists that may enable repair of the nervous system.

63) All of the following are mentioned in the passage as potential uses for prostheses except:
a) transportation of medication. b) induction of physical movement.
c) transportation of growth factor. d) removal of biochemicals from the cortex.

64) The initial function of microprobe channels is to:
a) create pathways. b) disrupt neurons.
c) replace ribbon cables. d) study the brain.

65) In a triangle ABC, if $\angle A = 30^\circ, b = 8, a = 6$ and $B = \sin^{-1} x$, then x is equal to:
a) 1 b) 1/2 c) 1/3 d) 2/3

66) If $\sin\theta$ is geometric mean between $\sin\phi$ and $\cos\phi$, then $\cos 2\theta =$
a) $2sin^2\left(\frac{\pi}{4} - \phi\right)$ b) $2cos^2\left(\frac{\pi}{4} - \phi\right)$
c) $2cos^2\left(\frac{\pi}{4} + \phi\right)$ d) $2sin^2\left(\frac{\pi}{4} + \phi\right)$

67) $\lim_{x\to\frac{\pi}{2}}\left[x\tan x - \left(\frac{\pi}{2}\right)\sec x\right]$ is equal to:
a) 1 b) -1 c) 0 d) $\pi/2$

68) Let a function $f(x)$ be defined by $f(x) = \frac{x-|x-1|}{x}$. Then which of the following is not true?
a) discontinuous at $x = 0$ b) discontinuous at $x = 1$
c) not differentiable at $x = 0$ d) not differentiable at $x = 1$

69) $\frac{d}{dx}\left[\tan^{-1}\left(\frac{\sqrt{x}(3-x)}{1-3x}\right)\right] =$
a) $\frac{1}{2(1+x)\sqrt{x}}$ b) $\frac{3}{(1+x)\sqrt{x}}$ c) $\frac{2}{(1+x)\sqrt{x}}$ d) $\frac{3}{2(1+x)\sqrt{x}}$

70) The curves $4x^2 + 9y^2 = 72$ and $x^2 - y^2 = 5$ at (3, 2):
a) touch each other b) cut orthogonally
c) intersect at 45° d) intersect at 60°

71) If $\int_{\sqrt{2}}^{x} \frac{dx}{x\sqrt{x^2-1}} = \frac{\pi}{12}$, then x is equal to:
a) 1/2 b) 2 c) -3 d) -1/2

72) The area bounded by the semicircle $y = \sqrt{4 - x^2}$ and its diameter $y = 0$ is:
a) 2π b) π c) $\frac{\pi}{2}$ d) $\frac{\pi}{4}$

73) If the coefficients of x^2 and x^3 in the expansion of $(3 + ax)^9$ are equal, then 'a' equals:
a) 3 b) 9/7 c) 7/9 d) -3

74) If 7th and 12th terms of H.P. are $\frac{1}{10}$ and $\frac{1}{25}$ respectively, then its 20th term is:
a) $\frac{1}{37}$ b) $\frac{1}{41}$ c) $\frac{1}{45}$ d) $\frac{1}{49}$

75) If $z = -\frac{2}{1+\sqrt{3}i}$, then value of arg (z) is:
a) π b) $\frac{\pi}{3}$ c) $\frac{2\pi}{3}$ d) $\frac{\pi}{4}$

76) The domain of the function $f(x) = e^{\sqrt{5x-3-2x^2}}$ is:
a) $\left(1, \frac{3}{2}\right)$ b) $\left[1, \frac{3}{2}\right]$ c) $[3/2, \infty)$ d) $(-\infty, 1)$

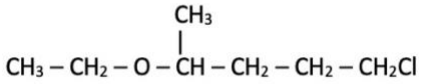
77) The extremities of a diameter of a circle have coordinates (-4, 3) and (12, -1). The length of the intercept which the circle makes on y-axis is:
a) $\sqrt{13}$ b) $2\sqrt{13}$ c) $3\sqrt{13}$ d) $4\sqrt{13}$

78) The distance between the directrices of a rectangular hyperbola is 10 units, then the distance between its foci is:
a) $10\sqrt{2}$ b) 5 c) $5\sqrt{2}$ d) 20

79) If projection of the line segment joining points $(a, 1, 0)$ and $(1, -2, 3)$ on a line which makes equal angles with three axes is $\frac{2}{\sqrt{3}}$, then the value of 'a' is:
a) 1 b) 2 c) 3 d) 0

80) The order of reactivity of the alkenes $(CH_3)_2C = CH_2$ (I), $CH_3CH = CH_2$ (II), $H_2C = CH_2$ (III) when subjected to acid catalyzed hydration is:
a) I > II > III b) I > III > II
c) III > II > I d) II > I > III

81) The IUPAC name of the given compound is:



a) 2-ethoxy-5-chloropentane b) 1-chloro-4-ethoxy-4-methyl butane
c) 1-chloro-4-ethoxy pentane d) ethyl-1-chloropentyl ether

82) Sodium bicarbonate on heating decomposes to form sodium carbonate, CO_2 and water. If 0.2 moles of sodium bicarbonate is completely decomposed, how many moles of sodium carbonate is formed?
a) 0.1 b) 0.2 c) 0.05 d) 0.025

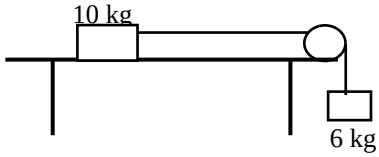
83) The correct order of the O–O bond length in O_2, H_2O_2 and O_3 is:
a) $H_2O_2 > O_3 > O_2$ b) $O_2 > O_3 > H_2O_2$
c) $O_2 > H_2O_2 > O_3$ d) $O_3 > H_2O_2 > O_2$

84) 250 ml of a sodium carbonate solution contains 2.65 g of Na_2CO_3. If 10 ml of this solution is diluted to one litre, what is the concentration of the resultant solution? (Molecular wt. of $Na_2CO_3 = 106$)
a) 0.1 M b) 0.01 M c) 0.001 M d) 10^{-4} M

85) How many grams of copper will be deposited from a solution of $CuSO_4$ by passing a 0.5 F of electric current?
a) 31.75 b) 63.5 c) 15.875 d) 127

86) Which one of the following elements has the highest ionization energy?
a) $[Ne]3s^23p^1$ b) $[Ne]3s^23p^2$ c) $[Ne]3s^23p^3$ d) $[Ar]3d^{10}4s^24p^2$

87) A string passing over a pulley contains 10 kg and 6 kg masses connected at its ends. The 6 kg mass hangs vertically, while 10 kg block is placed on the table. If the system is in dynamic equilibrium, i.e., moves with constant speed, the coefficient of dynamic friction is:



a) 0.3 b) 0.6 c) 0.10 d) 1.67

88) A thin circular disc of mass M and radius R rotating about its axis with a constant angular velocity ω. Two objects each of mass m are attached gently to the opposite ends of the diameter of the disc. The disc now rotates with an angular velocity:
a) $\frac{\omega M}{M+m}$ b) $\frac{\omega M}{M+2m}$ c) $\frac{\omega M}{M+4m}$ d) $\frac{\omega(M-2m)}{M+2m}$

89) Escape velocity of a body from earth is about 11 km/s. Assuming the mass and radius of earth to be about 81 and 4 times the mass and radius of moon respectively, the escape velocity in km/s from the surface of moon will be:
a) 0.54 b) 2.44 c) 11 d) 49.5

90) A particle executes S.H.M. Its velocities are v_1 and v_2 at displacements x_1 and x_2 from the mean position. The period of oscillation will be:
a) $2\pi\sqrt{\left(\frac{x_2^2-x_1^2}{v_1^2-v_2^2}\right)}$ b) $2\pi\sqrt{\left(\frac{v_1^2-v_2^2}{x_2^2-x_1^2}\right)}$
c) $2\pi\sqrt{\left(\frac{x_2^2+x_1^2}{v_1^2+v_2^2}\right)}$ d) $2\pi\sqrt{\left(\frac{v_1^2+v_2^2}{x_2^2+x_1^2}\right)}$

91) Assuming no heat losses, the heat released by the condensation of x gm of steam at 100˚C can be used to convert y gm of ice at 0˚C into water at 100˚C, the ratio of x: y is:
a) 1:1 b) 1:2 c) 1:3 d) 3:1

92) Heat is flowing through two cylindrical rods of same material. The diameters of the rods are in the ratio 1:2 and their lengths are in the ratio 2:1. If the temperature difference between their ends is same, then the ratio of amounts of heat conducted through them per unit time will be:
a) 1:1 b) 2:1 c) 1:4 d) 1:8

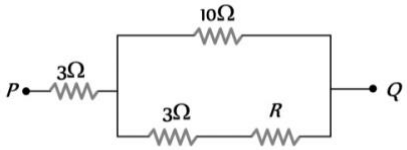
93) A biconvex lens has a focal length 2/3 times the radius of curvature of either surface. The refractive index of the lens is:
a) 1.75 b) 1.33 c) 1.5 d) 1.0

94) In Young's double slit experiment carried out with light of wavelength $\lambda = 5000$ Å, the distance between the slits is 0.2 mm and the screen is 2.00 metre away from the slits. The central maximum is at $n = 0$. The third maximum will be at a distance x (from central maximum) equal to:
a) 1.67 cm b) 1.5 cm c) 0.5 cm d) 5.0 cm

95) An object producing a pitch of 400 Hz flies past a stationary person. The object was moving in a straight line with a velocity 200 m/s. The velocity of sound is 300 m/s. The frequency of sound heard by the stationary person when the object is approaching him, is equal to:
a) 240 Hz b) 96 Hz c) 1200 Hz d) 960 Hz

96) Two-point charges +9e and +e is kept at distance 'a' from each other. A third charge is placed at distance 'x' from +9e on the line joining the above two charges. For the third charge to be in equilibrium, 'x' should be:
a) a b) a/2 c) 3a/4 d) 3a/8

97) In the circuit shown below, what is the value of unknown resistor 'R' so that the total resistance of the circuit between points P and Q is also equal to R?



a) 3 Ω b) $\sqrt{39}$ Ω c) $\sqrt{69}$ Ω d) 10 Ω

98) Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 cm and 40 cm and they carry current 0.2 and 0.3 ampere respectively in opposite direction. The magnetic field in weber/m^2 at the centre is:
a) $\frac{3}{4}\mu_0$ b) $\frac{1}{8}\mu_0$ c) $\frac{7}{8}\mu_0$ d) $\frac{5}{4}\mu_0$

99) An LR circuit consists of a resistance of 50 Ω and a coil of inductive reactance 120 Ω. If the circuit is connected across 260-volt ac mains, the current in the circuit is:
a) 2 A b) $\frac{26}{17}$ A c) $\frac{26}{5}$ A d) $\frac{13}{6}$ A

100) Plutonium decays with half-life of 24000 years. If plutonium is stored for 72000 years, the fraction of it that remains is:
a) 1/8 b) 1/3 c) 1/4 d) 1/2

Thank You!!!!!!