INSTITUTE OF ENGINEERING

Model Entrance Exam

(Set-12)

Instructions:

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

Date: 2080/05/02
(August-19)

Duration: 2 hours
Time: 8 AM – 10 AM

Section-A (1 marks)

1) Which of the following molecules has trigonal planar geometry?
   a) IF_3 b) PCl_3 c) NH_3 d) BF_3

2) The number of atoms in 0.1 mole of a triatomic gas is ($N_A = 6.023 \times 10^{23}$ mol^{-1}):
   a) 6.026×10^{22} b) 1.806×10^{23} c) 3.6×10^{23} d) 1.8×10^{22}

3) Which of the following salts will give highest pH in water?
   a) KCl   b) NaCl   c) Na_2CO_3 d) $CuSO_4$

4) Which of the following electronic configuration of an atom has the lowest ionization enthalpy?
   a) $1s^2, 2s^2 2p^6$ b) $1s^2, 2s^2 2p^3$
   c) $1s^2, 2s^2 2p^5, 3s^1$ d) $1s^2, 2s^2 2p^4$

5) The oxidation state of Cr in CrO_5 is:
   a) -6   b) +12   c) +6   d) + 4

6) Which of the following is an amphoteric hydroxide?
   a) $Ca(OH)_2$ b) $Mg(OH)_2$ c) $Be(OH)_2$ d) $Sr(OH)_2$

7) CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by:
   a) Benedict test   b) Iodoform test
   c) Tollen's reagent test   d) Fehling's solution test

8) CF_3COOH is stronger acid than acetic acid because of:
   a) inductive effect   b) electromeric effect
   c) mesomeric effect   d) resonance

9) When nitrobenzene is treated with Zn and aq. NH_4Cl, it gives:
   a) azobenzene   b) phenyl hydroxyl amine
   c) azoxy benzene   d) aniline

10) How many Cl^- ions are there around Na^+ ion in NaCl crystal?
    a) 3   b) 4   c) 6   d) 8

11) Gold and silver are extracted from their respective ores by:
    a) leaching   b) smelting   c) roasting   d) hydrometallurgy

12) Which allotrope of phosphorous produces phosphorescence?
    a) scarlet   b) red   c) black   d) white

13) Which of the following is not a thermodynamic function?
    a) internal energy   b) work done   c) enthalpy   d) entropy

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

15) The faculty _____ divided on the promotion arrangements made last week.
    a) is   b) were   c) has been   d) was

16) I must go _____ before the shops are closed.
    a) shopping   b) to shop   c) to shopping   d) shop

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

18) She would rather that you _____ then.
    a) work   b) had worked   c) worked   d) have worked

19) They differ _____ one another on many points.
    a) to   b) at   c) for   d) from

20) "I had my vaccination today." The word 'vaccination' has a stress primarily on its _____ syllable.
    a) first   b) second   c) third   d) fourth

21) The correct phonetic symbol of the underlined part of the word "Either" is:
    a) /eI/   b) /eə/   c) /Iə/   d) /aI/

22) "To spin a yarn" means:
    a) to try hard   b) to be inconsistent
    c) to make up a story   d) to be in charge

23) Confined (Antonym):
a) enclosed   b) liberate   c) cramped   d) incarcerated

24) Irrevocable (Synonym):
a) conclusive   b) changeable   c) flexible   d) alterable

25) The passive voice of, "She handles all tasks efficiently." is:
a) All tasks are handled efficiently by her.
b) All tasks were handled efficiently by her.
c) All tasks have been handled efficiently by her.
d) All tasks are being handled efficiently by her.

26) The grammatical pattern of the following sentence, "The committee made me secretary of the school" is:
a) S + V + O + A   b) S + V + O + C + A
c) A + S + V + O   d) A + S + V + C

27) The maximum value of the function $\sin x + \cos x$ is
a) 1   b) 2   c) $\sqrt{2}$ d) 1/2

28) 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) $\frac{7\pi}{10}$

29) 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) $2n\pi \pm \frac{\pi}{3}$

30) 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

31) $\lim\limits_{x \to 0} \frac{\sin 7x}{\sin 5x} =$
a) 7/5   b) 5/7   c) 0   d) ∞

32) 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

33) $\int \frac{1}{x\log x} dx =$
a) $\log x + c$ b) $\log\log x + c$ c) $\log x^2 + c$ d) $2\log x + c$

34) 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

35) 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

36) 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

37) 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

38) The eccentricity of the parabola $y^2 - 4x + 6y - 27 = 0$ is
a) 4   b) -1   c) 0   d) 1

39) 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

40) 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

41) $A - (B \cap C) =$
a) $(A - B) \cap (A - C)$ b) $(A \cap B) - C$
c) $(A \cup B) - C$ d) $(A - B) \cup (A - C)$

42) 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}

43) The complex number $\frac{1+2i}{1-i}$ lies in

  a) first quadrant   b) second quadrant   c) third quadrant   d) fourth quadrant

44) 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

45) $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{pmatrix}$ is a/an

  a) identity matrix   b) symmetric matrix   c) triangular matrix   d) diagonal matrix

46) 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

47) The quark combination for antineutron is:

  a) udd   b) uud   c) $\bar{u}\bar{d}\bar{d}$ d) $\bar{u}\bar{u}\bar{d}$

48) The dimensions for quantity of electricity are:

  a) M^0L^0TA b) $MLT^{-2}A^0$ c) $ML^2T^{-2}A^0$ d) $M^0L^0T^2A^2$

49) The moment of inertia of a circular ring of mass M and radius R about its diameter is:

  a) MR^2 b) $MR^2/2$ c) $3.2\ MR^2$ d) $2/3\ MR^2$

50) Young's modulus of a perfectly elastic body is:

  a) zero   b) infinity   c) 1   d) finite

51) The clouds float in atmosphere because of:

  a) their low temperature   b) their low viscosity

  c) their low-density   d) creation of low pressure

52) 50 g of benzene weighs:

  a) more in summer than in winter   b) equal in summer and in winter

  c) less in summer than in winter   d) more or less according to purity

53) The pressure of a gas in an enclosure is increased from 1 atmosphere to 4 atmosphere, the root mean square speed of gas molecules:

  a) remains same   b) becomes twice

  c) becomes four times   d) becomes half

54) The wavelength of monochromatic beam of light in vacuum is 6000 Å. When this beam enters in a medium of refractive index 2.0, the wavelength will become/remain:

  a) 6000 Å   b) 3000 Å   c) 4500 Å   d) 12000 Å

55) Oil floating in water shows become coloured fringes due to:

  a) interference of light   b) refraction of light

  c) diffraction of light   d) polarization of light

56) The fundamental frequency of a closed organ pipe of length 0.25 m, is (speed of sound = 340 m/s):

  a) 170 Hz   b) 340 Hz   c) 680 Hz   d) 1360 Hz

57) An air capacitor is connected to a battery. The effect of filling the space between the plates with a dielectric is to increase:

  a) the charge and the potential difference

  b) the potential difference and the electric field

  c) the electric field and the capacitance

  d) the charge and the capacitance

58) An electron moves with uniform velocity v and enters a region of uniform magnetic field B. If v and B are parallel to each other, then the electron will:

  a) continue to move in the same direction

  b) move in a direction perpendicular to B

  c) move in a circular path

  d) stop immediately

59) Which of the following is true for a wattless circuit?
   a) inductance is zero   b) capacitance is zero
   c) resistance is zero   d) net reactance is zero

60) When a radioactive nucleus emits a β-particle, the mass number of an atom:
   a) increases by one   b) remains same
   c) decreases by one   d) decreases by four

Section-B (2 marks)

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

Book clubs are a great way to meet new friends or keep in touch with old ones, while keeping up on your reading and participating in lively and intellectually stimulating discussions. If you're interested in starting a book club, you should consider the following options and recommendations.

The first thing you'll need are members. Before recruiting, think carefully about how many people you want to participate and also what the club's focus will be. For example, some book clubs focus exclusively on fiction, others read nonfiction. Some are even more specific, focusing only on a particular genre such as mysteries, science fiction, or romance. Others have a more flexible and open focus. All of these possibilities can make for a great club, but it is important to decide on a focus at the outset so the guidelines will be clear to the group and prospective member.

After setting the basic parameters, recruitment can begin. Notify friends and family, advertise in the local newspaper, and hang flyers on bulletin boards in local stores, colleges, libraries, and bookstores. When enough people express interest, schedule a kick-off meeting during which decisions will be made about specific guidelines that will ensure the club runs smoothly. This meeting will need to establish where the group will meet (rotating homes or a public venue such as a library or coffee shop); how often the group will meet, and on what day of the week and at what time; how long the meetings will be; how books will be chosen and by whom; who will lead the group (if anyone); and whether refreshments will be served and if so, who will supply them. By the end of this meeting, these guidelines should be set and a book selection and date for the first official meeting should be finalized.

Planning and running a book club is not without challenges, but when a book club is run effectively, the experience can be extremely rewarding for everyone involved.

61) Which of the following organizational patterns is the main one used in the passage?
   a) chronological   b) hierarchical
   c) comparison-contrast   d) cause and effect

62) According to the passage, when starting a book club, the first thing a person should do is
   a) hang flyers in local establishments. b) put an ad in a local newspaper.
   c) decide on the focus and size of the club. d) decide when and where the group will meet.

63) Which of the following would NOT be covered during the book club's kick-off meeting?
   a) deciding on whether refreshments will be served
   b) discussing and/or appointing a leader
   c) choosing the club's first selection
   d) identifying what kinds of books or genre will be the club's focus

64) Which of the following inferences can be drawn from the passage?
   a) Smaller groups are better for a variety of reasons.
   b) The social aspect of book clubs is more important than the intellectual.
   c) Starting your own book club is better than joining an existing one.
   d) When starting and running a book club, a casual approach is risky.

65) p^H of a saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$ is:
   a) 0.25×10^{-10} b) 0.125×10^{-15} c) 0.5×10^{-10} d) 0.5×10^{-15}

66) Standard electrode potential of three metals X, Y and Z are -1.2 V, +0.5 V, -3.0 V respectively. The reducing power of these metals will be:
a) $X > Y > Z$
b) $Z > X > Y$
c) $X > Y > Z$
d) $Y > Z > X$

67) The rate of diffusion of methane at a given temperature is twice that of a gas X. The molecular weight of X is:
a) 64
b) 32
c) 4
d) 2

68) For a first order reaction, A $\rightarrow$ Products, the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is:
a) 1.73×10^{-5} M/min
b) 3.47×10^{-4} M/min
c) 3.47×10^{-5} M/min
d) 1.73×10^{-4} M/min

69) The correct order of electron affinity of N, O, Al and Cl is:
a) N < O < Cl < Al
b) O < N < Al < Cl
c) Al < N < O < Cl
d) Cl < N < O < Al

70) When chlorine is passed over dry slaked lime at room temperature, the main reaction product is:
a) $Ca(ClO_2)_2$
b) $CaCl_2$
c) $CaOCl_2$
d) $Ca(OCl)_2$

71) The IUPAC name of the following compound is:

$$CH_3 - \overset{\overset{\displaystyle Cl}{|}}{C} = C - \overset{\overset{\displaystyle C_2H_5}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{CH}} - CH_2 - C \equiv CH$$

a) 6-chloro-4-ethyl-5-methylhept-5-en-1-yne
b) 6-chloro-4-ethyl-5-methylhept-1-yn-5-ene
c) 2-chloro-4-ethyl-3-methylhept-2-en-6-yne
d) 2-chloro-4-ethyl-3-methylhept-6-yn-2-ene

72) A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives:
a) benzyl alcohol and sodium formate
b) sodium benzoate and methyl alcohol
c) benzyl alcohol and methyl alcohol
d) sodium benzoate and sodium formate

73) 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) $\frac{a^3-b^3}{3abc}$

74) 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

75) 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) $\frac{1}{13}$

76) 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) $\begin{vmatrix} a^2 & b^2 & c^2 \\ p & q & r \\ x^2 & y^2 & z^2 \end{vmatrix}$

77) 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

78) 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) $2n\pi + \frac{\pi}{4}$

79) 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

80) 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) $\left(-\frac{a}{\sqrt{2}}, \frac{a}{\sqrt{2}}\right)$

81) 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

82) 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

83) Let $g(x) = f(x) - 1$. If $f(x) + f(1 - x) = 2 \ \forall \ x\epsilon R$, then $g(x)$ is symmetrical about:
a) the origin b) the line $x = \frac{1}{2}$
c) the point $(1,0)$ d) the point $\left(\frac{1}{2}, 0\right)$

84) $\lim\limits_{x \to 1} \frac{1 - x^2}{\sin 2\pi x}$ is equal to:
a) $\frac{1}{2\pi}$ b) $-\frac{1}{\pi}$ c) $-\frac{2}{\pi}$ d) $-\pi$

85) If $(\sin x)(\cos y) = 1/2$, then $\frac{d^2y}{dx^2}$ at $(\pi/4, \pi/4)$ is:
a) -4 b) -2 c) -6 d) 0

86) 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,∞)

87) $\int \frac{e^x}{\sqrt{4 - e^{2x}}} dx =$
a) $\sin^{-1}(e^x) + c$ b) $\cos^{-1}(e^x) + c$ c) $\sin^{-1}\left(\frac{e^x}{2}\right) + c$ d) $\cos^{-1}\left(\frac{e^x}{2}\right) + c$

88) A stone tied to one end of a string 100 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 22 s, then the acceleration of the stone is:
a) $16 \ m/s^2$ b) $4 \ m/s^2$ c) $12 \ m/s^2$ d) $8 \ m/s^2$

89) A bolt of mass 0.2 kg falls from the ceiling of an elevator moving down with a uniform speed of 5 m/s. It hits the floor of the elevator (length of the elevator = 5 m) and does not rebound. The amount of heat produced by the impact is $(g = 10 \ m/s^2)$:
a) 5 J b) 10 J c) 15 J d) 20 J

90) A steel wire of length 4.5 m and cross-sectional area $3 \times 10^{-5} \ m^2$ stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area of $4 \times 10^{-5} \ m^2$ under a given load. The ratio of the Young's modulus of steel to that of copper is:
a) 1.3 b) 1.5 c) 1.7 d) 1.9

91) If W_1 be the work to be done to form a bubble of volume V from a given solution. The work required to be done to form a bubble of volume 2 V is:
a) $4^{2/3} \ W_1$ b) $4^{1/3} \ W_1$ c) $2^{1/2} \ W_1$ d) $2^{3/2} \ W_1$

92) If a ball of 80 kg mass hits an ice cube and temperature of ball is 100°C, then how much ice is converted into water? (Specific heat of ball is 0.2 $cal\ g^{-1}$, Latent heat of ice = 80 $cal\ g^{-1}$)
 a) 20 g   b) 200 g   c) 2×10^3 g   d) 2×10^4 g

93) A refrigerator with coefficient of performance $\frac{1}{3}$ releases 200 J of heat to a hot reservoir. Then, the work done on the working substance is:
 a) $\frac{100}{3}$ J   b) 100 J   c) $\frac{200}{3}$ J   d) 150 J

94) A transverse harmonic wave on a string is described by $y(x,t) = 3 \sin \left(36t + 0.018x + \frac{\pi}{4}\right)$ where x and y are in cm and t is in second. Which of the following statements is incorrect?
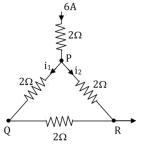 a) The wave is travelling in negative x-direction.
 b) The amplitude of the wave is 3 cm.
 c) The speed of the wave is 20 m/s.
 d) The frequency of the wave is $\frac{9}{\pi}$ Hz.

95) A metallic spherical shell has an inner radius R_1 and outer radius R_2. A charge is placed at the centre of the spherical cavity. The surface charge density on the inner surface is:
 a) $\frac{q}{4\pi R_1^2}$ b) $\frac{-q}{4\pi R_1^2}$ c) $\frac{q}{4\pi R_2^2}$ d) $\frac{q}{4\pi R_2^2}$

96) A current of 6A enters one corner P of an equilateral triangle PQR having 3 wires of resistances 2Ω each and leaves by the corner R. Then, the currents i_1 and i_2 respectively are:

 a) $2A, 4A$ b) $4A, 2A$ c) $1A, 2A$ d) $2A, 3A$

97) A 90 cm long solenoid has six layers of windings of 450 turns each. If the diameter of solenoid is 2.2 cm and current carried is 6A, then the magnitude of magnetic field inside the solenoid, near its centre is:
 a) $50\pi \times 10^{-4}$ T   b) $60\pi \times 10^{-4}$ T
 c) $72\pi \times 10^{-4}$ T   d) $80\pi \times 10^{-4}$ T

98) Double convex lenses are to be manufactured from a glass of refractive index 1.55, with both faces of same radius of curvature. What is the radius of curvature required if the focal length is to be 20 cm?
 a) 11 cm   b) 22 cm   c) 7 cm   d) 6 cm

99) A parallel beam of light of wavelength 600 nm is incident normally on a slit of width d. If the distance between the slits and the screen is 0.8 m and the distance of 2nd order maximum from the centre of the screen is 15 mm. The width of the slit is:
 a) 40 μm   b) 80 μm   c) 160 μm   d) 200 μm

100) The power gain for common base amplifier is 800 and the voltage amplification factor is 840. The collector current when base current is 1.2 mA is:
 a) 24 mA   b) 12 mA   c) 6 mA   d) 3 mA

Thank You!!!!!!