BEATS ENGINEERING

INSTITUTE OF ENGINEERING

Model Entrance Exam

(Set-11)

Instructions:

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

Date: 2080/04/27
(August-12)

Duration: 2 hours
Time: 8 AM – 10 AM

Section-A (1 marks)

1) A substance has boiling point 563 K, but is starts decomposing near this temperature. Which type of distillation process is suitable for this purification?
   a) simple distillation b) fractional distillation
   c) steam distillation d) distillation under reduced pressure
2) The IUPAC name of $CH_3 - O - C_2H_5$ is:
   a) ethoxy methane b) methoxy ethane
   c) ethyl methyl ether d) methyl ethyl ether
3) Reaction of HBr with propene in absence of peroxide is a/an:
   a) electrophilic addition b) free radical addition
   c) electrophilic substitution d) nucleophilic substitution
4) If an electron has spin quantum number of +1/2 and a magnetic quantum number of -1, it cannot be presented in:
   a) d-orbital b) f-orbital c) p-orbital d) s-orbital
5) The first step in the extraction of Cu from copper pyrites is:
   a) reduction by carbon b) electrolysis of ore
   c) roasting of ore in O_2 d) magnetic separation
6) Which of the following is strongest oxidizing agent?
   a) F_2 b) Cl_2 c) Br_2 d) I_2
7) Copper turnings when heated with concentrated sulphuric acid will give:
   a) SO_2 b) SO_3 c) H_2S d) O_2
8) Which of the following alkali metal ions has lowest ionic mobility in aqueous solution?
   a) Rb^+ b) Cs^+ c) Li^+ d) Na^+
9) Which of the following does not reflect the periodicity of elements?
   a) Bonding behaviour b) Electronegativity
   c) Ionization Potential d) Neutron/proton ratio
10) The mass of 112 cm^3 of NH_3 gas at STP is:
   a) 0.085 g b) 0.85 g c) 8.5 g d) 80.5 g
11) Normality of sulphuric acid containing 50 g of the acid in 500 mL of solution is:
   a) 2.04 N b) 0.49 N c) 0.98 N d) 0.35 N
12) The organizations _____ gathered for the seminar on managerial skill improvement.
   a) have b) has c) was d) is
13) She _____ the novel by tomorrow.
   a) will be completing b) has completed
   c) had completed d) will have completed
14) I urged him _____ the application form.
   a) sign b) to sign c) signing d) signed
15) He would rather _____ home tonight than go to the movies.
   a) stayed b) have stayed c) stay d) had stayed
16) We must dispense _____ our duties now. It is getting late.
   a) with b) in c) on d) at
17) I <u>was taken by storm</u> when I came to know he passed the exam.
   a) felt gloomy b) felt depressed c) felt surprised d) felt foolish
18) Sanchita said to Swastik, "I am planning to leave tomorrow."
   a) Sanchita told Swastik that she had planned to leave the next day.
   b) Sanchita told Swastik that she is planning to leave the next day.
   c) Sanchita told Swastik that she will plan to leave the next day.
   d) Sanchita told Swastik that she was planning to leave the next day.
19) Accentuate (Synonym):
   a) confuse b) baffle c) bewildered d) emphasize

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

21) The grammatical pattern of the sentence , "Every year, we visit the orphanage." is:
a) S + V + O + A b) S + V + IO + DO
c) A + S + V + IO + DO d) A + S + V + O

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

23) The correct phonetic symbol for the underlined word 'Either' is:
a) $/\theta/$ b) $/\int/$ c) $/\delta/$ d) $/d/$

24) A matrix $\begin{pmatrix} 0 & k+2 \\ 5 & 0 \end{pmatrix}$ is a skew symmetric matrix if $k =$
a) 3 b) -5 c) -7 d) -2

25) A and B are any two non-empty sets, then $(A \cap \bar{B}) =$
a) $A \cup B$ b) A c) $B - A$ d) $A - B$

26) If $f(2x+1) = x+1$, then $f(x^2) =$
a) $\frac{x^2+1}{2}$ b) $\frac{x^2+2}{2}$ c) $\frac{x^2-1}{2}$ d) $\frac{x^2-2}{2}$

27) The sum of 3 numbers of G.P. is 38 and their product is 1728. Then, the middle term is:
a) 12 b) 8 c) 18 d) 6

28) If α and β are the roots of the equation $4x^2 + 3x + 7 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta} =$
a) $\frac{4}{7}$ b) $\frac{-3}{7}$ c) $\frac{7}{3}$ d) $\frac{-7}{4}$

29) If $x = a + b, y = a\omega + b\omega^2, z = a\omega^2 + b\omega$, then the value of $x + y + z =$
a) 0 b) 1 c) -1 d) ω^2

30) If $\vec{a}$ and $\vec{b}$ are two non-zero vectors satisfying $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then $\vec{a}$ and $\vec{b}$ are:
a) parallel to each other b) perpendicular to each other
c) inclined at an angle of 60° d) inclined at an angle of 45°

31) The direction cosines of a line normal to the plane $2x - y + 2z = 0$ is:
a) $2, -1, 2$ b) $\frac{2}{9}, \frac{-1}{9}, \frac{2}{9}$ c) $\frac{2}{3}, \frac{-1}{3}, \frac{2}{3}$ d) $1, \frac{-1}{2}, 1$

32) $ax^2 + 2hxy + by^2 = 0$ represent a pair of perpendicular lines if:
a) a and b are equal in magnitude but opposite in sign
b) a and b are equal
c) a and b are opposite in sign
d) a and b are reciprocal to each other

33) If latus rectum of an ellipse is half of its minor axis, then its eccentricity is:
a) $\frac{3}{2}$ b) $\frac{2}{3}$ c) $\frac{\sqrt{3}}{2}$ d) $\frac{\sqrt{2}}{3}$

34) If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a} =$
a) 1 b) 3/2 c) -3/2 d) -3

35) The equation of tangent to the parabola $4y^2 + 6x = 8y + 7$ at its vertex is:
a) $6x = 11$ b) $6x + 11 = 0$ c) $y = 1$ d) $y + 1 = 0$

36) If $2\sec 2\alpha = \tan\beta + \cot\beta$, then the value of $(\alpha + \beta) =$
a) $\frac{\pi}{2}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{6}$

37) In ΔABC, $a = 2b$ and $A = 3B$, then angle A equals:
a) 30° b) 60° c) 90° d) 120°

38) If the function $f: R \to R$ is defined by $f(x) = 2x + \cos x$, then f is:
a) has a minimum at $x = \pi$ b) has a maximum at $x = 0$
c) is a decreasing function d) is an increasing function

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

40) $\int \tan^{-1}\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}\,dx =$

a) $x + c$ b) $\frac{x^2}{2} + c$

c) $-x + c$ d) $\frac{-x^2}{2} + c$

41) If $y = a\sin mx + b\cos mx$, then $\frac{d^2y}{dx^2}$ is equal to:

a) m^2y b) $-m^2y$

c) my d) $-my$

42) $\lim_{x\to\frac{\pi}{4}}\left(\frac{1-\tan x}{1-\sqrt{2}\sin x}\right) =$

a) -2 b) 2 c) -1 d) 0

43) If the function $f(x) = \frac{\sin 3x}{x}\ (x \neq 0) = \frac{k}{2}$ when $x = 0$ is continuous at $x = 0$, then $k =$

a) 2 b) 4 c) 6 d) 3

44) In Joule's law of heating, heat produced is directly proportional to:

a) current b) square root of current

c) square of current d) independent of current

45) Internal energy of real gas depends on:

a) Volume b) Temperature

c) Pressure d) Volume and Temperature

46) The dimension of Planck constant is same as that of:

a) Angular momentum b) Linear momentum

c) Energy d) Resistance

47) If an object of mass 'm' is moving in a circular path with uniform speed 'v', which of the following changes occurs in half revolution?

a) kinetic energy changes by $\frac{mv^2}{2}$ b) kinetic energy changes by mv^2

c) momentum changes by $2mv$ d) momentum does not changes

48) The time taken to move from mean position to half of amplitude in SHM is:

a) $\frac{T}{6}$ b) $\frac{T}{12}$

c) $\frac{T}{3}$ d) $\frac{T}{9}$

49) An excess electron is on a spherical body of area $2\ mm^2$. The surface charge density is:

a) 4×10^{-12} b) 8×10^{-12}

c) 4×10^{-14} d) 8×10^{-14}

50) An electric dipole is kept in a uniform electric field. It experiences:

a) a force and a torque b) a torque but no force

c) a force but not torque d) neither force nor torque

51) Velocity of a light in vacuum depends upon:

a) frequency b) wavelength

c) amplitude d) none of these

52) To detect the obstacles in their path, bats produce:

a) infrasonic waves b) ultrasonic waves

c) radio waves d) gamma waves

53) The phenomenon only associated with transverse wave is:

a) reflection b) refraction

c) polarization d) interference

54) "Water proofing" agent changes the angle of contact from:

a) obtuse to acute angle b) acute to obtuse angle

c) obtuse to 90° d) acute to 90°

55) A coil with its horizontal axis is perpendicular to the magnetic field. The angle between magnetic field and the plane of coil when induced emf is maximum is:
a) 90˚ b) 45˚ c) 30˚ d) 0˚

56) A girl presses her physics text book against a rough vertical wall with her hand. The direction of frictional force on the book exerted by the wall is:
a) downwards b) upwards
c) out from the wall d) into the wall

57) A PN junction diode can be used as:
a) rectifier b) capacitor c) inductor d) impedance

58) In β-emission from a radioactive substance, an electron is ejected. This electron comes from:
a) the outermost orbit of an atom b) the innermost orbits of an atom
c) the surface of a substance d) the nucleus of an atom

59) A lens behaves as a converging lens in air and diverging lens in water. The refractive index of material of lens is:
a) equal to air b) equal to water
c) more than air and less than water d) more than water

60) The velocity of photo electrons emitted in photoelectric effect depends on:
a) wavelength of incident light b) intensity of incident light
c) photoelectric current d) both b and c

Section-B (2 marks)

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

Photosynthesis is the process that plants use to convert sunlight into the food that they need to survive and grow. Most plants create some form of sugar from the sunlight, and this sugar is used by the plant as its primary food source

Plants actually need only three things to create this sugar: sunlight, carbon dioxide, and water. The sunlight reacts with the plant's chlorophyll, a green chemical which is used to convert water and carbon dioxide into sugar.

As a general rule, photosynthesis occurs in a plant's leaves. The leaf contains chlorophyll, which reacts when sunlight strikes the leaf. It is also the chlorophyll which gives the leaf its typical green color, since photosynthesis absorbs most light rays except green, which are reflected outwards.

The process of photosynthesis produces more than just sugar, however. One byproduct of the process is oxygen, which is "exhaled" by the plant into the atmosphere. In fact, plant photosynthesis is one of the primary sources of oxygen generation on our planet, making plant life essential to almost all living things on earth.

61) According to paragraph 4, which of the following is a byproduct of photosynthesis?
a) green pigment b) water
c) carbon dioxide d) oxygen

62) The underlined word essential, as used in paragraph 4, most nearly means
a) necessary b) optional
c) fragrant d) growing

63) The passage explains that photosynthesis is:
a) done in the plant stem. b) what makes plants edible.
c) the way that plants feed themselves. d) the source of carbon dioxide in the atmosphere.

64) After reading the passage, what can you infer about photosynthesis?
a) Human life would not survive without plants.
b) Chlorophyll tastes sweet.
c) Sunlight has both good and bad effects on plants.
d) Too much water can interfere with photosynthesis.

65) An element (X) which occurs in the second period has an outer electronic configuration s^2p^1, what is the formula and nature of its oxide?
a) XO_3, basic b) X_2O_3, basic
c) XO_3, acidic d) X_2O_3, acidic

66) The solubility product of a salt having general formula MX_2 in water is 4×10^{-12}. The concentration of M^{2+} ions in the aqueous solution of the salt is:
a) 2×10^{-6} M b) 1×10^{-4} M
c) 1.6×10^{-4} M d) 4×10^{-10} M

67) 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 $Fe + 2Fe^{3+} \longrightarrow 3Fe^{2+}$ will be:
a) 1.653 V b) 1.212 V c) 0.330 V d) 0.111 V

68) In the following reaction, $CaCl_2 \xrightarrow{H_2O} P \xrightarrow{hot\ iron\ tube} Q \xrightarrow{CH_3Cl,AlCl_3} R$, the product 'R' is:
a) benzene b) ethyl benzene
c) toluene d) n-propyl benzene

69) 2 g of metal carbonate is neutralized completely by 100 mL of 0.1 N HCl. The equivalent weight of metal carbonate is:
a) 50 b) 100 c) 150 d) 200

70) The electrons identified by quantum numbers n and l:
(i) n=4, l=1 (ii) n=4, l=0 (iii) n=3, l=2 (iv) n=3, l=1
can be placed in order of increasing energy as:
a) (iv) < (ii) < (iii) < (i) b) (ii) < (iv) < (i) < (iii)
c) (i) < (iii) < (ii) < (iv) d) (iii) < (iv) < (ii) < (i)

71) MnO_2 reacts with a halogen acid to give greenish yellow glass. When excess of this gas reacts with NH_3, an unstable trihalide is formed. In this process, the oxidation state of nitrogen changes from:
a) -3 to +3 b) -3 to 0 c) -3 to +5 d) 0 to -3

72) The area of triangle formed by the lines $4x^2 - 9xy - 9y^2 = 0$ and $x = 2$ is:
a) 10/3 b) 20/3 c) 2 d) 3

73) The point of intersection of tangents at the end points of the latus rectum of the parabola $y^2 = 4x$ is equal to:
a) (1, 0) b) (0, 1) c) (-1, 0) d) (0, -1)

74) Equation of a plane passing through $(1, -3, -2)$ and perpendicular to the planes $x + 2y + 2z = 5$ and $3x + 3y + 2z = 8$ is:
a) $2x + 4y + 3z + 16 = 0$ b) $2x - 4y - 3z + 8 = 0$
c) $2x - 4y + 3z - 8 = 0$ d) $2x + 4y - 3z - 16 = 0$

75) If $\vec{a}, \vec{b}$ and $\vec{c}$ are vectors of magnitude 3, 4 and 5 respectively and $\vec{a} \perp (\vec{b} + \vec{c}), \vec{b} \perp (\vec{c} + \vec{a})$ and $\vec{c} \perp (\vec{a} + \vec{b})$, then $|\vec{a} + \vec{b} + \vec{c}|$ is:
a) 50 b) $5\sqrt{2}$ c) 1 d) 25

76) The lines $2x - 3y - 5 = 0$ and $3x - 4y - 7 = 0$ are the diameters of a circle with area 49π square units. Then the equation of circle is:
a) $x^2 + y^2 + 2x - 2y = 67$ b) $x^2 + y^2 + 2y - 2x = 47$
c) $x^2 + y^2 + 2x - 2y = 47$ d) $x^2 + y^2 - 2x + 2y = 62$

77) If $\cos^{-1} x + \cos^{-1} y = \frac{\pi}{2}$, and $\tan^{-1} x - \tan^{-1} y = 0$, then $x^2 + xy + y^2 =$
a) 0 b) $\frac{1}{\sqrt{2}}$ c) $\frac{3}{2}$ d) $\frac{1}{8}$

78) The range of $f(x) = \sin^{-1}\left(\sqrt{x^2 + x + 1}\right)$ is:
a) $(0, \frac{\pi}{2}]$ b) $(0, \frac{\pi}{3}]$
c) $[\frac{\pi}{2}, \frac{\pi}{3}]$ d) $[\frac{\pi}{6}, \frac{\pi}{3}]$

79) $\begin{vmatrix} x+4 & x & x \\ x & x+4 & x \\ x & x & x+4 \end{vmatrix} =$

a) $(x+4)^3$ b) $4(x+4)$
c) $16(3x+4)$ d) $x^2(x+4)$

80) If a, b, c are in G.P., a, x, b are in A.P. and b, y, c are in A.P., then $\frac{1}{x}+\frac{1}{y}=$

a) 2b b) $\frac{2}{b}$ c) $a+c$ d) $2b-a$

81) The number of words which can be formed using letters of the word 'ARRANGE' so that vowels always occupy even places, is:

a) 144 b) 156 c) 72 d) 36

82) $log_e n + \frac{(log_e n)^3}{3!} + \frac{(log_e n)^5}{5!} + \cdots \infty =$

a) $\frac{n^2-1}{2n}$ b) $\frac{n^2+1}{2n}$
c) $\frac{n(n-1)}{2n}$ d) $\frac{n(n+1)}{2n}$

83) The value of $\lim_{x\to 1} \frac{1-\sqrt{x}}{(\cos^{-1} x)^2}$ is:

a) 4 b) 1/2 c) 2 d) 1/4

84) If $y = \sec(\tan^{-1} x)$, then $\frac{dy}{dx}$ at $x = 1$ is:

a) $\cos\frac{\pi}{4}$ b) $\sin\frac{\pi}{2}$ c) $\sin\frac{\pi}{6}$ d) $\cos\frac{\pi}{3}$

85) $\int \left(\frac{x+2}{x+4}\right)^2 e^x\, dx =$

a) $e^x\left(\frac{x}{x+4}\right)+c$ b) $e^x\left(\frac{x+2}{x+4}\right)+c$
c) $e^x\left(\frac{x-2}{x+4}\right)+c$ d) $e^x\left(\frac{2x}{x+4}\right)+c$

86) The area of the rectangle bounded by $|x| = 2$, the x-axis and $y = 1$ (in square units) is:

a) 2 b) 3 c) 4 d) 6

87) A ball is thrown vertically upwards with a velocity of 20 m/s from the top of a multistorey building 25 m high. The time taken by the ball to reach the ground is:

a) 2s b) 3s c) 5s d) 7s

88) The ceiling of a hall is 40 m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 m/s without hitting the ceiling of the hall is:

a) 90° b) 30° c) 45° d) 60°

89) A solid cylinder of mass M and radius R rolls without slipping down an inclined plane making an angle θ with the horizontal. Then, its acceleration is:

a) $\frac{1}{3}g\sin\theta$ b) $\frac{2}{3}g\sin\theta$ c) $\frac{2}{5}g\sin\theta$ d) $\frac{2}{7}g\sin\theta$

90) The escape speed of a body on the Earth's surface is 11.2 km/s. A body is projected with thrice of this speed. The speed of the body when it escapes the gravitational pull of Earth is:

a) 11.2 km/s b) $22.4\sqrt{2}$ km/s c) $\frac{22.4}{\sqrt{2}}$ km/s d) 22.4 km/s

91) At what velocity does water emerge from an orifice in a tank in which gauge pressure is $3\times10^5\ Nm^{-2}$ before the flow starts? (density of water $= 1000\ kgm^{-3}$)

a) 24.5 m/s b) 14.5 m/s c) 34.5 m/s d) 44.5 m/s

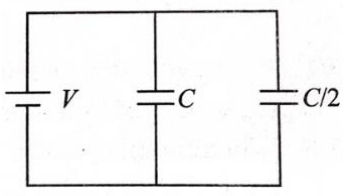
92) Two moles of an ideal monoatomic gas occupy a volume 2V at temperature 300 K. It expands to a volume 4V adiabatically, then the final temperature of a gas is:

a) 179 K b) 189 K c) 199 K d) 219 K

93) A stretched wire emits a fundamental note of 256 Hz. Keeping the stretching force constant and reducing the length of wire by 10 cm, the frequency becomes 320 Hz, the original length of the wire is:

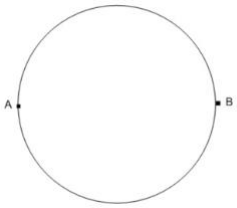
a) 100 cm b) 50 cm c) 400 cm d) 200 cm

94) Two condensers, one of capacity C and other of capacity C/2 are connected to a V volt battery, as shown in the figure. The work done in fully charging both the condensers is:



a) $\frac{1}{4}CV^2$ b) $\frac{3}{4}CV^2$
c) $\frac{1}{2}CV^2$ d) $2CV^2$

95) A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure is:



a) 3 Ω b) 6π Ω c) 6 Ω d) 0.6π Ω

96) A solenoid has core of a material with relative permeability 500 and its windings carry a current of 1 A. The number of turns of the solenoid is 500 per metre. The magnetization of the material is:
a) $2.5 \times 10^3\ Am^{-1}$ b) $2.5 \times 10^5\ Am^{-1}$
c) $2.0 \times 10^3\ Am^{-1}$ d) $2.0 \times 10^5\ Am^{-1}$

97) An alternating supply of 220 V is applied across a circuit with resistance 22 Ω and impedance 44 Ω. The power dissipated in the circuit is:
a) 1100 W b) 550 W c) 2200 W d) (2200/3) W

98) In a compound microscope, the focal length of two lenses are 1.5 cm and 6.25 cm. If an object is placed at 2 cm from objective and the final image is formed at 25 cm from the eye lens. The distance between the two lenses is:
a) 6 cm b) 7.75 cm c) 9.25 cm d) 11 cm

99) In Young's double slit experiment, distance between two sources is 0.1 mm. The distance of screen from the source is 20 cm. Wavelength of light used is 5460 Å. Then, angular position of the first dark fringe is:
a) 0.08˚ b) 0.16˚ c) 0.20˚ d) 0.31˚

100) The energy required to excite an electron in hydrogen atom to its first excited state is:
a) 8.5 eV b) 10.2 eV c) 12.7 eV d) 13.6 eV

Thank You!!!!!!