BEATS ENGINEERING

# INSTITUTE OF ENGINEERING

## MODEL ENTRANCE EXAM

(Beats Test Series - Day 3)

Instructions:

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

**Date** : 2081/05/04
(August 20)

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

**SECTION – A (1 marks)** (1*60 = 60)

1) None of the information _____ conveyed.
a) was b) are c) were d) have been

2) I urged him _____ the application form.
a) sign b) to sign c) signing d) signed

3) After mother _____ dinner, she went out.
a) cooked b) cooks c) was cooking d) had cooked

4) I would rather that you _____ the work today.
a) not do b) didn't do c) hadn't done d) haven't done

5) It is 3 O' clock _____ your watch.
a) in b) at c) on d) by

6) Which of the following best explains the idiom "Burn the midnight oil"?
a) to work late into the night b) to waste time
c) to be extremely lucky d) to have a short temper

7) The correct direct speech form of the following sentence is:
"He told them that they should study harder if they wanted to succeed."
a) He said to them, "You should study harder if you want to succeed."
b) He said, "They should study harder if they want to succeed."
c) He said, "You should study harder if they want to succeed."
d) He said to them, "You should study hard if you wanted to succeed."

8) The correct affirmative form of the following sentence is:
"No sooner had we reached the station than the train left."
a) As soon as we reached the station, the train left.
b) The train left as we reached the station.
c) When we reached the station, the train had already left.
d) We reached the station before the train left.

9) In the word "teacher," which phoneme represents the "ch" sound?
a) /ʃ/ b) /tʃ/ c) /dʒ/ d) /s/

10) In which of the following words is the stress on the third syllable?
a) inability b) photographer c) economy d) education

11) Impetuous (Synonym):
a) cautious b) rash c) thoughtful d) deliberate

12) Aberration (Antonym):
a) deviation b) normality c) variation d) anomaly

13) Let A={x:x is a prime factor of 240}, B={x:x is the sum of any two prime factors of 240}. Then:
a) $5 \in A \cap B$ b) $7 \in A \cap B$ c) $8 \in A \cap B$ d) $8 \in A \cup B$

14) Which of the following statements is false?
a) If $|A| = 0$, then $|\text{adj } A| = 0$.
b) Adjoint of a diagonal matrix of order $3 \times 3$ is a diagonal matrix.
c) Product of two upper triangular matrices is a upper triangular matrix
d) $\text{adj}(AB) = \text{adj}(A)\,\text{adj}(B)$

15) The value of $2e^{i\pi/3}$ is:
a) $1 + i$ b) $1 + \sqrt{3}i$ c) $\sqrt{3} - i$ d) $2 + 2\sqrt{2}i$

16) The sum of the series of the multiples of 5 from 5 to 100 both incluusive is:
a) 2010 b) 1250 c) 1050 d) 2520

17) Three persons enter a railway carriage, where there are 5 vacant seats. In how many ways can they seat themselves?
a) 15 b) 12 c) 50 d) 60

18) In the expansion of $(1+x)^{10}$, the value of $C_1 + C_3 + C_5 + C_7 + C_9$ is:
a) $2^{10}$ b) $2^{11}$ c) $2^9$ d) $2^{18}$

19) If $7sin^2x + 3cos^2x = 4$, the general solution of equation is:
a) $n\pi \pm \frac{\pi}{4}$ b) $n\pi \pm \frac{\pi}{3}$
c) $n\pi \pm \frac{\pi}{6}$ d) $n\pi \pm \frac{\pi}{2}$

20) $\text{cosec}^{-1}\left\{\text{cosec}\frac{5\pi}{4}\right\} =$
a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) $-\frac{\pi}{4}$ d) $-\frac{\pi}{2}$

21) In ΔABC, $\frac{\cos B}{b} + \frac{\cos C + \cos A}{c+a} =$
a) $\frac{1}{a}$ b) $\frac{1}{b}$ c) $\frac{1}{c}$ d) $c + \frac{a}{b}$

22) The orthocentre of a triangle is (-3, 5) and the circumcentre is (6, 2). Then the centroid is:
a) (1, 2) b) (3, 3) c) (2, 3) d) (1, -4)

23) The length of latus rectum of the parabola $x^2 = 12y$ is:
a) 4 b) 8 c) 12 d) 16

24) The eccentricity of the hyperbola whose asymptotes are $3x + 4y = 2$ and $4x - 3y = 5$ is:
a) 1 b) 2 c) $\sqrt{2}$ d) $\sqrt{3}$

25) Distance between two parallel planes $2x + y + 2z = 8$ and $4x + 2y + 4z + 5 = 0$ is:
a) 7/2 b) 5/2 c) 3/2 d) 9/2

26) The projection of $(\hat{\imath} + \hat{\jmath} + \hat{k})$ upon $(\hat{\imath} - \hat{\jmath} + \hat{k})$ is:
a) 1 b) $1/\sqrt{3}$ c) $\sqrt{3}/2$ d) 2

27) Four coins are tossed simultaneously. What is the probability of getting 2H and 2T?
a) 1/8 b) 1/4 c) 3/8 d) 1/16

28) $\lim_{x\to\infty}\left(1+\frac{5}{x}\right)^x =$
a) $e$ b) ∞ c) $e^5$ d) $1/e$

29) 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) $-1$

30) The function $y = x^3 + 3x^2 - 9x + 12$ has point of inflection at:
a) 2 b) 3 c) 1/2 d) -1

31) $\int_0^{\pi} cos^3x\, dx =$
a) -1 b) 0 c) 1 d) $\pi$

32) The integrating factor for the differential equation $x\frac{dy}{dx} + 2y = x^2 \ln x$ is:
a) $x^2$ b) $2x$ c) $e^{2x}$ d) $2\ln x$

33) Which of the following is the dimensions of the coefficient of friction?
a) $[M^2L^2T]$ b) $[M^0L^0T^0]$
c) $[ML^2T^{-2}]$ d) $[M^2L^2T^2]$

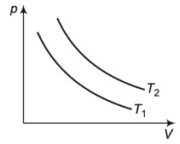
34) The greatest height to which a man can throw a stone is h. The greatest distance to which he can throw it will be:
a) h/2 b) h c) 2h d) 3h

35) A particle moves with constant speed v along a circular path of radius r and completes the circle in time T. The acceleration of the particle is:
a) $\frac{2\pi v}{T}$ b) $\frac{2\pi r}{T}$ c) $\frac{2\pi r^2}{T}$ d) $\frac{2\pi v^2}{T}$

36) The total energy of a particle, executing simple harmonic motion is:
a) $\propto x$ b) $\propto x^2$
c) independent of x d) $\propto x^{1/2}$

37) Two spherical black bodies of radii $r_1$ and $r_2$ and with surface temperatures $T_1$ and $T_2$ respectively, radiate the same power. Then, $r_1/r_2$ must be equal to:
a) $\left(\frac{T_1}{T_2}\right)^2$ b) $\left(\frac{T_2}{T_1}\right)^2$ c) $\left(\frac{T_1}{T_2}\right)^4$ d) $\left(\frac{T_2}{T_1}\right)^4$

38) The figure below shows graph of pressure and volume of a gas at two temperatures $T_1$ and $T_2$. Which of the following is correct?




a) $T_1 > T_2$ b) $T_1 = T_2$
c) $T_1 < T_2$ d) Nothing can be said about temperatures

39) Frequency range of the audible sounds is:
a) 0 Hz-30 Hz b) 20 Hz-20 kHz
c) 20 kHz-20,000 kHz d) 20 kHz-20 MHz

40) When a body is earth connected, electrons from the earth flow into the body. This means the body is:
a) uncharged b) charged positively
c) charged negatively d) an insulator

41) When a charged particle enters in a uniform magnetic field, its kinetic energy:
a) remains constant b) increases c) decreases d) becomes zero

42) A series L-C-R circuit is operated at resonance. Then:
a) voltage across R is minimum b) impedance is mnimum
c) impedance is maximum d) current amplitude is minimum

43) An object is placed 40 cm from a concave mirror of focal length 20 cm. The image formed is:
a) real, inverted and same in size b) real, inverted and smaller in size
c) virtual, erect and larger in size d) virtual, erect and smaller in size

44) When light is refracted, which of the following does not change?
a) wavelength b) frequency c) velocity d) amplitude

45) The impurity atoms which are mixed with pure silicon to make a p-type semiconductor are those of:
a) phosphorous b) boron c) antimony d) copper

46) The expansion of galaxies is supported by:
a) neutron star b) white dwarf star c) red shift d) black holes

47) Among the following pair of compounds, the one that illustrate the laws of proportion is:
a) $NH_3$ and $NCl_3$ b) $H_2S$ and $SO_2$ c) $CuO$ and $Cu_2O$ d) $CS_2$ and $FeSO_4$

48) The orbital angular momentum of a p-electron is:
a) $\sqrt{\frac{3}{2}}\frac{h}{\pi}$ b) $\sqrt{6}\frac{h}{2\pi}$ c) $\frac{h}{\sqrt{2}\pi}$ d) $\sqrt{3}\frac{h}{2\pi}$

49) Under identical experimental conditions, which of the following pair of gases will be most easy to separate by diffusion?
a) $H_2, D_2$ b) $O_2, N_2$
c) $^{235}U_6$, $^{238}U_6$ d) $H_2, O_2$

50) In which of the following sets, all the properties belong to same category (all extensive or all intensive)?
a) mass, volume, pressure b) temperature, pressure, volume
c) heat capacity, density, entropy d) enthalpy, internal energy, volume

51) For the reaction, $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$, the unit of $k_p$ will be:
a) atm b) $(atm)^3$ c) $(atm)^{-2}$ d) $(atm)^2$

52) The conjugate acid of $NH_2^-$ is:
a) $NH_4^+$ b) $NH_3$ c) $N_2H_4$ d) $NH_2OH$

53) The alkali metal halide soluble in pyridine is:
a) NaCl b) LiCl c) KCl d) NaBr

54) Beryllium and Aluminium have similar properties because:
a) they belong to the same group.
b) they have same charge
c) they have similar outer elecreonic configuration.
d) they have same polarizing power.

55) Which of the following is a good conductor of heat and electricity?
a) anthracite b) diamond c) charcoal d) graphite

56) Which of the following is a secondary pollutant?
a) NO b) CO c) $SO_2$ d) phenol

57) Gold and Silver are extracted from their respective ores by:
a) leaching b) smelting c) roasting d) hydro metallurgy

58) Impure glycerine is purified by:
a) steam distillation b) simple distillation
c) vacuum distillation d) fractional distillation

59) The compound which will not show tautomerism is:
a) methanal b) ethanal c) propanal d) propanone

60) Which among the following is most stable carbocation?
a) $CH_3 - \overset{+}{C}H_2$ b) $CH_2 = \overset{+}{C}H$ c) $CH \equiv \overset{+}{C}$ d) $\overset{+}{C}_6H_5$

**SECTION – B ( 2 marks)** (2*40=80)

61) The domain of the function $f(x) = \sin^{-1}\left(log_3\left(\frac{x}{3}\right)\right)$ is:
a) [-1, 9] b) [-9, 1] c) [-9, -1] d) [1, 9]

62) If $D_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $D_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$, then:
a) $D_1 = 3{D_2}^2$ b) $\frac{d}{dx}(D_1) = 3D_2$
c) $\frac{d}{dx}(D_1) = 3{D_2}^2$ d) $D_1 = 3D_2$

63) If the roots of the equation $px^2 + qx + r = 0$ are in the ratio 3:4, then:
a) $12p^2 = 49qr$ b) $12q^2 = 49pr$
c) $4p^2 = 9rq$ d) $7pq = 12r^2$

64) The value of $\frac{1}{2}.\frac{1}{3} - \frac{1}{4}.\frac{1}{3^2} + \frac{1}{6}.\frac{1}{3^3} + \cdots + \infty$ is:
a) $\frac{1}{2}\log(4/3)$ b) $\log(3/4)$
c) $\log 4 - 2\log 3$ d) $log_e 3$

65) The solution of $\tan 2x \,.\tan x = 1$ is:
a) $\frac{\pi}{3}$ b) $(6n \pm 1)\frac{\pi}{6}$ c) $(4n \pm 1)\frac{\pi}{6}$ d) $(2n \pm 1)\frac{\pi}{6}$

66) The equations of bisectors of the angles between the pair of lines $x^2 + 2xy\,\mathrm{cosec}\,\theta + y^2 = 0$ is:
a) $(x-y)^2 = 0$ b) $(x-y)2x = 0$
c) $(x-y)(x+y) = 0$ d) $(x-y)xy = 0$

67) The equation of the circle which touches the coordinates axes at (3, 0) and (0, 3) is:
a) $x^2 + y^2 + 6x + 6y = 0$ b) $x^2 + y^2 - 4x - 6y - 12 = 0$

c) $x^2+y^2-2x+6y-9=0$ c) $x^2+y^2-6x-6y+9=0$

68) An equation of the ellipse whose length of the major axis is 10 and foci are $(\pm 2, 0)$ is:
a) $\frac{x^2}{25}+\frac{y^2}{21}=1$ b) $\frac{x^2}{25}+\frac{y^2}{4}=1$ c) $\frac{x^2}{25}+\frac{y^2}{16}=1$ d) $\frac{x^2}{29}+\frac{y^2}{25}=1$

69) The direction cosines of the line joining the points A(-1, 2, 5) and B(-2, 4, 3) are:
a) $-\frac{1}{3},\frac{2}{3},-\frac{2}{3}$ b) $\frac{1}{4},-\frac{3}{4},\frac{7}{4}$ c) $-\frac{1}{3},-\frac{2}{3},\frac{2}{3}$ d) $\frac{1}{2},\frac{3}{2},-\frac{1}{2}$

70) If $\vec{a},\vec{b},\vec{c}$ are unit vectors such that $\vec{a}-\vec{b}+\vec{c}=0$, then $\vec{c}.\vec{a}=$?
a) 3/2 b) -1/2 c) 1/3 d) -1/3

71) The mean deviation about median from the data 340, 150, 210, 240, 300, 310, 320 is:
a) 50 b) 52.8 c) 55 d) 45

72) $\lim_{x\to 1}\frac{x+x^2+x^3+\cdots+x^n-n}{x-1}=$
a) $n^2+1$ b) $\frac{n(n+1)}{2}$ c) $(2n-1)$ d) $(n+1)$

73) If $y=\sqrt{\tan x+\sqrt{\tan x+\sqrt{\tan x+\cdots+\infty}}}$, then $\frac{dy}{dx}=$
a) $\frac{1}{(2y-1)}$ b) $\frac{\sec x.\tan x}{(2y+1)}$ c) $\frac{sec^2x}{(2y-1)}$ d) $\frac{\sec x.\tan x}{(2y-1)}$

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

75) The area bounded by the curves $y=3x$ and $y=x^2$ is (in square unit):
a) 10 b) 5 c) 4.5 d) 9

76) Velocity of a body moving along a straight line with uniform acceleration 'a' reduces by $\frac{3}{4}$ of its initial velocity in time $t_0$. The total time of motion of the body till its velocity becomes zero is:
a) $\frac{4}{3}t_0$ b) $\frac{3}{2}t_0$ c) $\frac{5}{3}t_0$ d) $\frac{8}{3}t_0$

77) A man of mass 50 kg stands on a frame of mass 30 kg. He pulls on a light rope which passes over a pulley. The other end of the rope is attached to the frame. For the system to be in equilibrium what force man must exert on the rope?
a) 40 g b) 80 g c) 30 g d) 50 g

78) A thin rod of length L is bent to form a semicircle. The mass of rod is M. What will be the gravitational potential at the centre of the circle?
a) $-\frac{GM}{L}$ b) $-\frac{GM}{2\pi L}$ c) $-\frac{\pi GM}{2L}$ d) $-\frac{\pi GM}{L}$

79) Water flows in a streamlined manner through a capillary tube of radius a, the pressure difference being p and the rate of flow Q. If the radius is reduced to a/2 and the pressure increased to 2p, then rate of flow becomes:
a) 4Q b) Q c) Q/4 d) Q/8

80) A lead bullet of 10 g travelling at 300 m/s strikes against a block of wood and comes to rest. Assuming 50% of heat is absorbed by the bullet, the increase in its temperature is:
a) 100˚C b) 125˚C c) 150˚C d) 200˚C

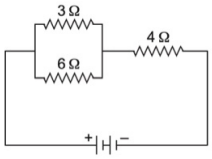
81) A gas for which $\gamma=1.5$ is suddenly compressed to th of $\frac{1}{4}^{\text{th}}$ the initial volume. Then, the ratio of the final to the initial pressure is:
a) 1:16 b) 1:8 c) 1:4 d) 8:1

82) A source of sound of frequency 600 Hz is placed inside water. The speed of sound in water is 1500 m/s and in air is 300 m/s. The frequency of sound recorded by an observer who is standing in air, is:

a) 200 Hz b) 300 Hz c) 120 Hz d) 600 Hz

83) The capacitance of a parallel plate capacitor is 16μF. When a glass slab is placed between the plates, the potential difference reduces to 1/8th of the original value. What is dielectric constant of glass?
a) 4 b) 8 c) 16 d) 32

84) In the figure, current through the 3 Ω resistor is 0.8 A, then potential drop through 4 Ω resistor is:




a) 9.6 V b) 2.6 V c) 4.8 V d) 1.2 V

85) A magnet of magnetic moment M is situated with its axis along the direction of a magnetic field of strength B. The work done is rotating it by an angle of 180°will be:
a) -MB b) +MB c) zero d) +2MB

86) A prism, having refractive index $\sqrt{2}$ and refracting angle 30°, has one of the refracting surfaces polished. A beam of light incident on the other refracting surface will trace its path, if the angle of incidence is:
a) 0˚ b) 30˚ c) 45˚ d) 60˚

87) Two slits are separated by a distance of 0.5 mm and illuminated with light of λ = 6000 Å. If the screen is placed 2.5 m from the slits. The distance of the third bright image from the centre will be:
a) 1.5 mm b) 3 mm c) 6 mm d) 9 mm

88) The work function for tungsten and sodium are 4.5 eV and 2.3 eV respectively. If the threshold wavelength λ for sodium is 5600 Å, the value of λ for tungsten is:
a) 5893 Å b) 10683 Å c) 2862 Å d) 528 Å

89) Electrolysis of concentrated solution of potassium acetate gives:
a) methane b) ethane c) ethene d) ethyne

90) Conversion of alkyl cyanide to primary amines is known as:
a) Stephan's reduction b) Rosenmund's reduction
c) Mendius reduction d) Cannizzaro's reaction

91) In which of the following molecules/ions, the central atom is $sp^2$ hybridised?
a) $\bar{N}H_2$ and $H_2O$ b) $\bar{B}F_3$ and $\bar{N}O_2$
c) $\bar{N}O_2$ and $H_2O$ d) $\bar{N}O_2$ and $\bar{N}H_2$

92) When one Faraday of electricity is passed through $CuSO_4$ solution, the number of atoms formed at cathode will be:
a) $6.02 \times 10^{23}$ b) $3.01 \times 10^{23}$
c) 2 d) $6.02 \times 10^{-23}$

93) For the first order reaction, half life is 14 s. Time required for the initial concentration to reduce to $\frac{1}{8}^{\text{th}}$ of its value is:
a) 28 s b) 42 s c) $(14)^3$ s d) $(14)^2$ s

94) On the basis of composition, the oxidation number of iron in $Fe_3O_4$ is/are:
a) +2 and +3 b) +1 and +2 c) +2 only d) +3 only

95) The acidic, basic or amphoteric nature of $Mn_2O_7$, $V_2O_5$ and CrO are respectively:
a) acidic, acidic and basic b) basic, amphoteric and acidic
c) acidic, amphoteric and basic d) acidic, basic and basic

96) The final acid obtained during the manafacture of $H_2SO_4$ by ccontact process is:
a) $H_2SO_4$ (conc) b) $H_2SO_4$ (dil) c) $H_2S_2O_4$ d) $H_2S_2O_7$

Read the following passage and answer the questions given below (97-100).
Recent advancements in medical science have revolutionized the way we diagnose and treat diseases. Innovations such as precision medicine, which tailors treatment to individual genetic profiles, have significantly improved patient outcomes. Additionally, breakthroughs in biotechnology and pharmaceuticals have led to the development of new therapies and vaccines. However, the high cost of these innovations and the need for rigorous clinical trials pose challenges for widespread implementation.

97) How has precision medicine impacted patient outcomes, according to the passage?
a) It has made treatments less effective b) It has improved treatment personalization
c) It has increased the cost of healthcare d) It has limited the availability of treatments

98) What are some of the advancements mentioned in the passage that have impacted medical science?
a) Traditional medicine and herbal remedies b) Biotechnology and pharmaceuticals
c) Surgical techniques and physical therapy d) Home remedies and dietary changes

99) What is one of the challenges associated with recent medical advancements?
a) Decreased interest in medical research
b) High cost and need for clinical trials
c) Increased availability of traditional treatments
d) Lack of new medical innovations

100) According to the passage, what role do biotechnology and pharmaceuticals play in medical science?
a) They are outdated methods of treatment
b) They contribute to the development of new therapies and vaccines
c) They are less effective than traditional methods
d) They are primarily used for diagnostic purposes

**❖❖❖❖ Thank You!!! ❖❖❖❖**