

INSTITUTE OF ENGINEERING

MODEL ENTRANCE EXAM

(Beats Test Series - Day 4)

Instructions:

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

Date : 2081/05/05
(August 21)

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

- 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 $\operatorname{cosec}^{-1} x = \sin^{-1} \frac{1}{x}$, 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 $\vec{a} \cdot \vec{b} \geq 0$, 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) 16 g of oxygen has same number of molecules as in:
 a) 16 g of CO b) 28 g of N_2 c) 14 g of N_2 d) 2 g of H_2
- 34) Which of the following is not permissible arrangement of electrons in an atom?
 a) $n = 5, l = 3, m = 0, s = +1/2$ b) $n = 3, l = 2, m = -3, s = -1/2$
 c) $n = 3, l = 2, m = -2, s = -1/2$ d) $n = 4, l = 0, m = 0, s = -1/2$
- 35) Dipole induced dipole interaction are present in which pair?
 a) H_2O and alcohol b) Cl_2 and CCl_4 c) HCl and He d) SiF_4 and He
- 36) 1 mole of H_2SO_4 is mixed with 2 moles of $NaOH$. The heat evolved will be:
 a) 57.3 kJ b) 2×57.3 kJ
 c) $57.3/2$ kJ d) cannot be predicted
- 37) Which of the following factors will change the value of equilibrium constant for the reaction between N_2 and O_2 ?
 a) increasing concentration of N_2 and O_2 b) increasing pressure
 c) increasing temperature d) adding a catalyst
- 38) Which is the correct representation for the solubility product constant of Ag_2CrO_4 ?
 a) $[Ag^+]^2 [CrO_4^{2-}]$ b) $[Ag^+][CrO_4^{2-}]^2$
 c) $[2Ag^+][CrO_4^{2-}]$ d) $[2Ag^+]^2 [CrO_4^{2-}]$
- 39) The electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^3$. What is the atomic number of an element which is just below the above element in the periodic table?
 a) 33 b) 34 c) 31 d) 49

- 55) 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
- 56) 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
- 57) 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
- 58) Temperature coefficient of resistance of semiconductor is:
a) zero b) constant c) positive d) negative
- 59) Which of the following can be used to generate Radiowaves?
a) Rectifier b) Modulator c) Amplifier d) Oscillator
- 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) (2*40=80)

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

Greyhound racing is the sixth most popular spectator sport in the United States. Over the last decade, a growing number of racers have been adopted to spend their retirement as household pets, once their racing careers are over.

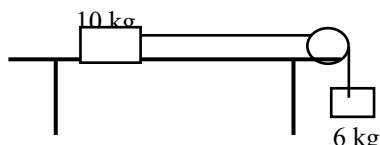
Many people hesitate to adopt a retired racing greyhound because they think only very old dogs are available. Actually, even champion racers only work until they are about three-and-a-half years old. Because greyhounds usually live to be 12 to 15 years old, their retirement is much longer than their racing careers.

People worry that a greyhound will be more nervous and active than other breeds and will need a large space to run. These are false impressions. Greyhounds have naturally sweet, mild dispositions, and while they love to run, they are sprinters rather than distance runners and are sufficiently exercised with a few daily laps around a fenced-in backyard.

Greyhounds do not make good watchdogs, but they are very good with children, get along well with other dogs (and usually cats as well), and are affectionate and loyal. They are intelligent, well-behaved dogs, usually housebroken in only a few days. A retired racing greyhound is a wonderful pet for almost anyone.

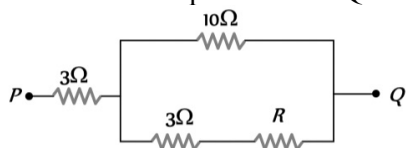
- 61) According to the passage, adopting a greyhound is a good idea for people who:
a) do not have children. b) live in apartments.
c) do not usually like dogs. d) already have another dog or a cat.
- 62) Which of the following is implied by the passage?
a) The public is more aware of greyhounds than they used to be.
b) Greyhounds are more competitive than other dogs.
c) Greyhound racing should not be allowed.
d) People who own pet rabbits should not adopt greyhounds.
- 63) One drawback of adopting a greyhound is that:
a) greyhounds are not good with children.
b) greyhounds are old when they retire from racing.
c) the greyhound's sensitivity makes it temperamental.
d) greyhounds are not good watch dogs.
- 64) This passage is most like an advertisement because it:
a) uses statistics to prove its point.
b) does not present information to substantiate its claims.
c) says nothing negative about greyhounds.
d) encourages people to do something.

- 82) A first order reaction is 75% complete after 32 minutes. When was 50% of the reaction completed?
 a) 4 min b) 8 min c) 16 min d) 32 min
- 83) An organic compound made of C, H and N contains 20% nitrogen. Its molecular weight is:
 a) 70 b) 140 c) 100 d) 65
- 84) Which one of the transition metal ions is coloured?
 a) Cu^+ b) Zn^{2+} c) Sc^{3+} d) V^{4+}
- 85) One gas bleaches the colours of flowers by reduction and the other by oxidation. The two gases are respectively:
 a) Cl_2 and SO_2 b) Br_2 and H_2S c) SO_2 and Cl_2 d) NH_3 and SO_2
- 86) $C_2H_2 \xrightarrow{HgSO_4/H_2SO_4, H_2O} X \rightleftharpoons Y$. Here, Y is:
 a) CH_3CH_2OH b) $CH_2 = CH - OH$
 c) CH_3CH_2CHO d) CH_3CHO
- 87) Propanal on treatment with dil. NaOH forms:
 a) $CH_3CH_2CH_2CH_2CH_2CHO$ b) $CH_3CH_2CH(OH)CH_2CH_2CHO$
 c) $CH_3CH_2CH_2CH(OH)CH_2CHO$ d) $CH_2CH_2CH(OH)CH(CH_3)CHO$
- 88) 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
- 89) 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) $\frac{\omega(M-2m)}{M+2m}$
- 90) 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
- 91) 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) $2\pi \sqrt{\frac{(x_2^2 - x_1^2)}{v_1^2 - v_2^2}}$ b) $2\pi \sqrt{\frac{(v_1^2 - v_2^2)}{x_2^2 - x_1^2}}$
 c) $2\pi \sqrt{\frac{(x_2^2 + x_1^2)}{v_1^2 + v_2^2}}$ d) $2\pi \sqrt{\frac{(v_1^2 + v_2^2)}{x_2^2 + x_1^2}}$
- 92) Assuming no heat losses, the heat released by the condensation of x gm of steam at $100^\circ C$ can be used to convert y gm of ice at $0^\circ C$ into water at $100^\circ C$, the ratio of $x:y$ is:
 a) 1:1 b) 1:2 c) 1:3 d) 3:1
- 93) 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
- 94) 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
- 95) In Young's double slit experiment carried out with light of wavelength $\lambda = 5000 \text{ \AA}$, 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

- 96) 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
- 97) 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) $3a/8$
- 98) 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) 3Ω b) $\sqrt{39}\Omega$ c) $\sqrt{69}\Omega$ d) 10Ω
- 99) An LR circuit consists of a resistance of 50Ω and a coil of inductive reactance 120Ω . 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) The wavelength of radiation emitted is λ_0 , when an electron jumps from the third to the second orbit of hydrogen atom. For the electron jump from the fourth to the second orbit of the hydrogen atom, the wavelength of radiation emitted will be:
 a) $\frac{16}{25}\lambda_0$ b) $\frac{20}{27}\lambda_0$ c) $\frac{27}{20}\lambda_0$ d) $\frac{25}{16}\lambda_0$

❖❖❖❖ Thank You!!! ❖❖❖❖