

## **INSTITUTE OF ENGINEERING**

### **Model Entrance Exam**

(Set-5)

#### **Instructions:**

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

**Section-A (1 marks)**

- 1) Ferocious (Antonym)  
a) gentle                      b) fierce                      c) predatory                      d) vicious
- 2) Affable (Synonym)  
a) irritable                      b) grouchy                      c) miserable                      d) courteous
- 3) Are you \_\_\_\_\_ or against this proposal?  
a) at                      b) for                      c) with                      d) over
- 4) To cast one's net wide means \_\_\_\_\_.  
a) to take great personal risk                      b) to disclose information tactfully  
c) to have a big success                      d) to spread one's efforts in all directions
- 5) The passive voice of "They had invited me." is  
a) I shall be invited by them.                      b) I was invited by them.  
c) I was being invited by them.                      d) I had been invited by them.
- 6) Which among the following is a complex sentence?  
a) I paid off my father's debts.  
b) He betrayed his country, and this was to his eternal disgrace.  
c) I saw a football match which was thrilling.  
d) First deserve, then desire.
- 7) The word 'manager' has a stress primarily on its \_\_\_\_\_ syllable.  
a) first                      b) second                      c) third                      d) fourth
- 8) He has the capacity \_\_\_\_\_ the job.  
a) of doing                      b) at doing                      c) with doing                      d) for doing
- 9) It was a boring weekend. \_\_\_\_\_ anything.  
a) I didn't do                      b) I don't do                      c) I didn't did                      d) I don't done
- 10) She should \_\_\_\_\_ the matter seriously.  
a) look into                      b) look over                      c) look through                      d) look after
- 11) The deficit \_\_\_\_\_ so large, we will probably have to pay for additional taxes.  
a) is growing                      b) grows                      c) has grown                      d) was growing
- 12) Had she known about it, she \_\_\_\_\_ have stayed longer.  
a) might                      b) should                      c) shall                      d) would
- 13) The SI unit of pressure gradient is:  
a)  $Nm^{-2}$                       b)  $Nm$                       c)  $Nm^{-1}$                       d)  $Nm^{-3}$
- 14) Free fall of an object in vacuum is a case of motion with:  
a) uniform velocity                      b) uniform acceleration  
c) variable acceleration                      d) uniform speed
- 15) During inelastic collision between two bodies, which of the following quantities always remain conserved?  
a) Total kinetic energy                      b) Total mechanical energy  
c) Total linear momentum                      d) Speed of each body
- 16) According to Hooke's law of elasticity, if stress is increased, the ratio of stress to strain:  
a) decreases                      b) increases                      c) becomes zero                      d) remains constant
- 17) If a soap bubble expands, the pressure inside the bubble:  
a) decreases                      b) increases  
c) remains the same                      d) is equal to the atmospheric pressure
- 18) Which of the following motions is not simple harmonic?  
a) vertical oscillations of a spring                      b) motion of a simple pendulum  
c) motion of planet around the Sun                      d) oscillation of liquid in U-tube
- 19) Change in temperature of the medium changes:  
a) frequency of sound waves                      b) amplitude of sound waves  
c) wavelength of sound waves                      d) loudness of sound waves

- 20) If an ideal gas undergoes isothermal process from some initial state  $i$  to the final state  $f$ , then the change in internal energy during this process is:  
a)  $dU = dQ$                       b)  $dU = dW$                       c)  $dU = 0$                       d)  $dU = dW$
- 21) The boiling water is changing into steam. Under this condition, the specific heat of water is:  
a) zero                      b) one                      c) infinite                      d) less than one
- 22) If one penetrates a uniformly charged hollow sphere, the electric field strength  $E$  :  
a) increases                      b) decreases  
c) remains the same as at the surface                      d) is zero at all points
- 23) Dispersive power depends upon:  
a) the shape of prism                      b) angle of prism  
c) height of prism                      d) material of prism
- 24) Transverse nature of light was confirmed by the phenomenon of:  
a) refraction of light                      b) diffraction of light  
c) dispersion of light                      d) polarization of light
- 25) Which of these particles having the same kinetic energy has the largest de Broglie wavelength?  
a) electron                      b) alpha particle                      c) proton                      d) neutron
- 26) When an electron jumps from the fourth orbit to the second orbit, one gets the:  
a) second line of Paschen series                      b) second line of Balmer series  
c) first line of Pfund series                      d) second line of Lyman series
- 27) Phase difference between voltage and current in a capacitor in an ac circuit is:  
a)  $\pi$                       b)  $\pi/2$                       c) 0                      d)  $\pi/3$
- 28) If number of turns in primary and secondary coils is increased to two times each, the mutual inductance:  
a) becomes 4 times                      b) becomes 2 times  
c) becomes  $1/4$  times                      d) remains unchanged
- 29) An electric heater is connected to the voltage supply. After few seconds, current gets its steady value. Then, its initial current will be:  
a) equal to its steady current                      b) slightly higher than its steady current  
c) slightly less than its steady current                      d) zero
- 30) The total number of neutrons present in 1.8 g of  $H_2O$  is:  
a)  $0.1 N_A$                       b)  $0.8 N_A$                       c)  $N_A$                       d)  $8 N_A$
- 31) The magnetic quantum number for valence electron of Na-atom is:  
a) 3                      b) 2                      c) 1                      d) 0
- 32) Which of the following molecules has zero dipole moment?  
a)  $H_2O$                       b)  $CO_2$                       c) HF                      d) HBr
- 33) Oxidation number of Nickel in  $Ni(CO)_4$  is:  
a) 0                      b) +4                      c) -4                      d) +2
- 34) If a strip of copper metal is placed in a solution of ferrous sulphate, then:  
a) Copper will precipitate out                      b) Iron will precipitate out  
c) Copper will dissolve                      d) No reaction will take place
- 35) Which of the following has the lowest first ionization potential?  
a) B                      b) C                      c) N                      d) O
- 36) Cryolite is an ore of:  
a) Iron                      b) Silver                      c) Zinc                      d) Aluminium
- 37) The electrophile in the nitration of benzene is:  
a)  $NO_2^+$                       b)  $NO_2$                       c)  $NO^+$                       d)  $NO_2^-$
- 38) The reagent which is used to distinguish propene and propyne is:  
a) Bromine                      b) Alkaline  $KMnO_4$   
c) Ammoniacal  $AgNO_3$                       d) Ozone
- 39) When chlorine gas is passed over dry slaked lime at room temperature, the product formed is:  
a)  $Ca(ClO_2)_2$                       b)  $CaCl_2$                       c)  $CaOCl_2$                       d)  $Ca(OCl)_2$

- 40) Which of the following ions doesn't give coloured solution?  
 a)  $Fe^{2+}$                       b)  $Zn^{2+}$                       c)  $Cr^{3+}$                       d)  $Mn^{2+}$
- 41) The range of the function  $f(x) = \sqrt{x^2 - 4x + 6}$  is:  
 a)  $(-\infty, \infty)$               b)  $[-\sqrt{2}, \sqrt{2}]$               c)  $(-\infty, -\sqrt{2}]$               d)  $[\sqrt{2}, \infty)$
- 42)  $\lim_{x \rightarrow 0} \frac{1}{x} \sin^{-1} \left( \frac{2x}{1+x^2} \right) =$   
 a) 0                              b) 1                              c) 2                              d)  $\infty$
- 43) If  $y = \sqrt{\sin x + y}$ , then  $\frac{dy}{dx} =$   
 a)  $\frac{\cos x}{2y-1}$                       b)  $-\frac{\cos^2 x}{2y-1}$                       c)  $\frac{2y-1}{\cos x}$                       d)  $-\frac{\sin^2 x}{2y-1}$
- 44) The function  $f(x) = \frac{x}{2} + \frac{2}{x}$  has a local minimum at:  
 a)  $x = 2$                       b)  $x = -2$                       c)  $x = 0$                       d)  $x = 1$
- 45)  $\int \sec^2 x \operatorname{cosec}^2 x \, dx =$   
 a)  $\tan x - \cot x + c$                       b)  $\sec x - \operatorname{cosec} x + c$   
 c)  $\cot x - \tan x + c$                       d)  $\sin x - \cos x + c$
- 46) A and B are two non-empty sets, then  $(A \cap \bar{B}) =$   
 a)  $(A \cup B)$                       b) A                              c)  $(B - A)$                       d)  $(A - B)$
- 47) The system of equations  $kx + 3y = 0$  and  $x + 2y = 0$  has no solution if:  
 a)  $k = 2/3$                       b)  $k = 3/2$                       c)  $k = 0$                       d)  $k = -1$
- 48) The sum of 1<sup>st</sup> n natural numbers is 1/5 times the sum of their squares. Then, n =  
 a) 5                              b) 6                              c) 7                              d) 8
- 49) If sum of the roots of the equation  $x^2 + px + q = 0$  is equal to sum of their squares, then:  
 a)  $p^2 + p = 2q$                       b)  $p^2 + 2p = q$                       c)  $p^2 - 2q = 2p$                       d)  $p^2 + q^2 = 1$
- 50) Which one is not a complex number?  
 a)  $(\pi, -\pi)$                       b)  $(e, -e)$                       c)  $(\sqrt{e}, i^8)$                       d)  $(\sqrt{-4}, \sqrt{4})$
- 51) If  $\log_a 3 = 2$  and  $\log_b 8 = 3$ , then  $\log_a b$  is equal to:  
 a)  $\log_3 2$                       b)  $\log_2 3$                       c)  $\log_3 4$                       d)  $\log_4 3$
- 52) If  $a\vec{i} + \vec{j} + \vec{k}, \vec{i} + b\vec{j} + \vec{k}$  and  $\vec{i} + \vec{j} + c\vec{k}$  are co-planar, then:  
 a)  $a + b + c = 0$                       b)  $abc = 1$   
 c)  $abc + 2 = a + b + c$                       d)  $a + b + c + 2 = abc$
- 53) In  $\Delta ABC$ ,  $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C =$   
 a)  $a + b + c$                       b) 0                              c)  $2(a + b + c)$                       d)  $a + b - c$
- 54)  $\cos^{-1}(-x) - \sin^{-1} x =$   
 a)  $\pi/2$                               b)  $\pi/3$                               c)  $\pi/4$                               d)  $\pi/6$
- 55) The function  $f(x) = x^6 + \tan^2 x$  is:  
 a) an even function                      b) an odd function  
 c) neither even nor odd                      d) a constant term
- 56) The y-intercept made on the co-ordinate axes by the plane  $x + 2y - 2z = 9$  is:  
 a) 1/4                              b) -2/3                              c) 9/2                              d) 3/4
- 57) The latus rectum of the hyperbola  $16x^2 - 9y^2 = 144$  is:  
 a) 16/3                              b) 15/4                              c) 8/5                              d) 32/3
- 58) The parametric equation  $x = a\cos\theta$  and  $y = b\sin\theta$  represents:  
 a) a circle                              b) a parabola                              c) a hyperbola                              d) an ellipse
- 59) The length of the y-intercept made by the circle  $x^2 + y^2 - 8x + y - 20 = 0$  is:  
 a) 5                              b) 9                              c) 6                              d) 4
- 60) The value of p for which the lines  $3x + y + 2 = 0, 2x - y + 3 = 0$  and  $x + py = 3$  are concurrent is:  
 a) -1                              b) 4                              c) -4                              d) 2

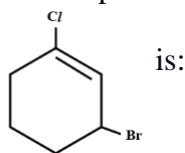
**Section-B (2 marks)**

Read the following passages and answer the questions given below:

Our voyage was very prosperous, but I shall not trouble the reader with a journal of it. The captain called in at one or two ports and sent in his long-boat for provisions and fresh water, but I never went out of the ship still we came into the Downs, which was on the 3rd day of June, 1706, about nine months after my escape. I offered to leave my goods in security for payment of my freight, but the captain protested he would not receive one farthing. We took kind leave of each other, and I made him promise that he would come to see me at my house in Redriff. I hired a house and a guide for five shillings which I borrowed from the captain.

- 61) On the voyage, the author:  
a) left the ship at intervals  
b) was not able to leave the ship because it did not stop  
c) never left the ship at all  
d) never left the ship till they came into the Downs
- 62) In the context of the passage, the word 'provisions' means:  
a) mainly food  
b) mainly security  
c) money  
d) mainly ammunition
- 63) For the payment of the author's freight, the captain:  
a) kept his goods as security  
b) refused to accept any money  
c) protested against being paid only a farthing  
d) accepted a sum of money
- 64) From the passage, it is clear that the captain's attitude to the author was:  
a) one of hostility  
b) one of indifference  
c) one of extreme friendliness and kindness  
d) one of disgust and irritation
- 65) A cricketer can throw a ball to a maximum horizontal distance of 100 m. With the same speed how much high above the ground can the cricketer throw the same ball?  
a) 50 m  
b) 100 m  
c) 150 m  
d) 200 m
- 66) A block of mass 10 kg is placed on rough horizontal surface whose coefficient of friction is 0.5. If a horizontal force of 100 N is applied on it, then acceleration of the block will be [Take  $g = 10 \text{ ms}^{-2}$ ]:  
a)  $10 \text{ ms}^{-2}$   
b)  $5 \text{ ms}^{-2}$   
c)  $15 \text{ ms}^{-2}$   
d)  $0.5 \text{ ms}^{-2}$
- 67) The moment of inertia of a body about a given axis is  $1.2 \text{ kg m}^2$ . Initially the body is at rest. In order to produce a rotational kinetic energy of 1500 Joule, an angular acceleration of  $25 \text{ rad/s}^2$  must be applied about the axis for a duration of:  
a) 4 sec  
b) 2 sec  
c) 8 sec  
d) 10 sec
- 68) A body weighs 72 N on the surface of the Earth. What is the gravitational force on it due to the Earth at a height equal to half the radius of the Earth?  
a) 16 N  
b) 28 N  
c) 32 N  
d) 72 N
- 69) A metallic sphere floats in an immiscible mixture of water ( $\rho_w = 10^3 \text{ kg/m}^3$ ) and a liquid ( $\rho_L = 13.5 \times 10^3 \text{ kg/m}^3$ ) such that its  $(4/5)^{th}$  portion is in water and  $(1/5)^{th}$  portion in the liquid. The density of metal is:  
a)  $4.5 \times 10^3 \text{ kg/m}^3$   
b)  $4.0 \times 10^3 \text{ kg/m}^3$   
c)  $3.5 \times 10^3 \text{ kg/m}^3$   
d)  $3.0 \times 10^3 \text{ kg/m}^3$
- 70) The density of water at  $20^\circ\text{C}$  is  $998 \text{ kg/m}^3$  and at  $40^\circ\text{C}$  is  $992 \text{ kg/m}^3$ . Then the mean coefficient of cubical expansion is:  
a)  $1 \times 10^{-4} /^\circ\text{C}$   
b)  $2 \times 10^{-4} /^\circ\text{C}$   
c)  $3 \times 10^{-4} /^\circ\text{C}$   
d)  $6 \times 10^{-4} /^\circ\text{C}$
- 71) Energy is being emitted from the surface of a black body at  $127^\circ\text{C}$  at the rate of  $1 \times 10^6 \text{ J/s-m}^2$ . The temperature of black body at which the rate of energy emission is  $16 \times 10^6 \text{ J/s-m}^2$  will be:  
a)  $254^\circ\text{C}$   
b)  $508^\circ\text{C}$   
c)  $527^\circ\text{C}$   
d)  $727^\circ\text{C}$

- 72) A bus is moving with the velocity of 5 m/s towards a huge wall. The driver sounds a horn of frequency 165 Hz. If the speed of sound in air is 335 m/s, the number of beats heard per second by the passenger inside the bus is:  
 a) 3                      b) 4                      c) 5                      d) 6
- 73) Two capacitors of 2  $\mu\text{F}$  and 4  $\mu\text{F}$  are connected in parallel. A third capacitor of 6  $\mu\text{F}$  is connected in series. The combination is connected across a 12 V battery. The voltage across 2  $\mu\text{F}$  capacitor is:  
 a) 2 V                      b) 8 V                      c) 6 V                      d) 1 V
- 74) A galvanometer of resistance 10  $\Omega$  gives full scale deflection when 1 mA current passes through it. The resistance required to convert it into a voltmeter reading upto 2.5 V is:  
 a) 24.9  $\Omega$                       b) 249  $\Omega$   
 c) 2490  $\Omega$                       d) 24900  $\Omega$
- 75) A magnetizing field of  $2 \times 10^3 \text{ Am}^{-1}$  produces a magnetic flux density of  $8\pi$  T in an iron rod. The relative permeability of the rod will be:  
 a)  $10^4$                       b) 1                      c)  $10^3$                       d)  $10^2$
- 76) A circuit area 0.01  $\text{m}^2$  is kept inside a magnetic field which is normal to its plane. The magnetic field changes from 2 T to 1 T in 1 millisecond. If the resistance of the circuit is 2  $\Omega$ , the rate of heat evolved is:  
 a) 5 J/s                      b) 50 J/s  
 c) 0.05 J/s                      d) 0.5 J/s
- 77) The refractive index of material of a plano-convex lens if the radius of curvature of the convex surface is 10 cm and focal length of the lens is 30 cm will be:  
 a) 6/5                      b) 7/4                      c) 2/3                      d) 4/3
- 78) A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minima is at a distance of 2.5 mm from the centre of the screen. The width of the slit is:  
 a) 0.2 mm                      b) 1 mm                      c) 2 mm                      d) 1.5 mm
- 79) The half-life of a radioactive substance is 30 days. What is the time taken to disintegrate to  $3/4^{\text{th}}$  of its original mass?  
 a) 30 days                      b) 15 days                      c) 60 days                      d) 90 days
- 80) The e.m.f. of the cell  $\text{Cu}(s)|\text{Cu}^{2+}(1\text{M})||\text{Ag}^+(1\text{M})|\text{Ag}$  is 0.46 V. The standard reduction potential of  $\text{Ag}^+/\text{Ag}$  is 0.80 V. The standard reduction potential of  $\text{Cu}^{2+}/\text{Cu}$  is:  
 a) -0.34 V                      b) 1.26 V                      c) -1.26 V                      d) 0.34 V
- 81) The IUPAC name of the compound



- a) 6-bromo-2-chlorocyclohexene                      b) 3-bromo-1-chlorocyclohexene  
 c) 1-bromo-3-chlorocyclohexene                      d) 2-bromo-6-chlorohex-1-ene
- 82) Which of the following compounds has the highest boiling point?  
 a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$                       b)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$   
 c)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{Cl}$                       d)  $(\text{CH}_3)_3\text{CCl}$
- 83) The correct sequence which shows decreasing order of the ionic radii of the elements is:  
 a)  $\text{Na}^+ > \text{F}^- > \text{Mg}^{2+} > \text{O}^{2-} > \text{Al}^{3+}$                       b)  $\text{O}^{2-} > \text{F}^- > \text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+}$   
 c)  $\text{Al}^{3+} > \text{Mg}^{2+} > \text{Na}^+ > \text{F}^- > \text{O}^{2-}$                       d)  $\text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+} > \text{O}^{2-} > \text{F}^-$
- 84) 7.2 g of a dibasic acid was dissolved in 250 ml solution. 25 ml of the solution requires 32 ml of 0.5 N NaOH for neutralization. The molecular weight of the acid is:  
 a) 45                      b) 90                      c) 80                      d) 40
- 85) A monoprotic acid is 1% ionized in its aqueous solution of 0.1 M strength. Its  $p^{\text{OH}}$  will be:  
 a) 11                      b) 3                      c) 10                      d) 2

- 86) If  $f(x) = \sin x + \cos x, g(x) = x^2 - 1$ , then  $g(f(x))$  is invertible in the domain:  
 a)  $\left[0, \frac{\pi}{2}\right]$       b)  $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$       c)  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$       d)  $[0, \pi]$
- 87)  $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x^2 - 2x - \sin(x-2)} =$   
 a) 0      b) 3      c)  $\infty$       d) 2
- 88) If  $f(x) = \begin{cases} x, & x \leq 1 \\ x^2 + bx + c, & x > 1 \end{cases}$   
 then the values of b and c respectively if f(x) is differentiable at  $x = 1$  is:  
 a) 0, -1      b) -1, 0      c) -1, 1      d) 1, -1
- 89) If  $y = \sqrt{\log x + \sqrt{\log x + \sqrt{\log x + \dots \infty}}}$ , then  $\frac{dy}{dx} =$   
 a)  $\frac{x}{2y-1}$       b)  $\frac{x}{2y+1}$       c)  $\frac{1}{x(2y-1)}$       d)  $\frac{1}{x(1-2y)}$
- 90)  $\int \frac{\sqrt{x^2+1}}{x^4} dx =$   
 a)  $-\frac{1}{3} \frac{(x^2+1)^{3/2}}{x^3} + c$       b)  $x^3(x^2+1)^{-1/2} + c$   
 c)  $\frac{\sqrt{x^2+1}}{x^2} + c$       d)  $\frac{1}{3} \frac{(x^2+1)^{3/2}}{x^3} + c$
- 91) The area of the closed figure bounded by the curves  $y = \sqrt{x}, y = \sqrt{4-3x}$  and  $y = 0$  is:  
 a) 8/9 sq. units      b) 9/8 sq. units      c) 2/9 sq. units      d) 3/2 sq. units
- 92) If  $\cot \theta - \tan \theta = \sec \theta$ , then  $\theta$  is equal to:  
 a)  $n\pi + (-1)^n \frac{\pi}{6}$       b)  $n\pi + \frac{\pi}{2}$       c)  $2n\pi + \frac{3\pi}{2}$       d)  $2n\pi + \frac{7\pi}{2}$
- 93) 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
- 94) If  $x = -9$  is a root of the equation  $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ , then its other two roots are:  
 a) 2, 7      b) -2, 7      c) 2, -7      d) -2, -7
- 95) If  $z = 1 + i$ , then the multiplicative inverse of  $z^2$  is:  
 a)  $1 - i$       b)  $i/2$       c)  $-i/2$       d)  $2i$
- 96) The sum to infinity of the series  $\frac{1}{1!} + \frac{4}{2!} + \frac{7}{3!} + \frac{10}{4!} + \dots \infty$  is:  
 a)  $e + 4$       b)  $e + 2$       c)  $e$       d)  $3e$
- 97) If the term independent of x in the expansion of  $\left(\sqrt{x} - \frac{k}{x^2}\right)^{10}$  is 405, then k =  
 a) -3      b) 3      c)  $\pm 3$       d)  $\pm 5$
- 98) If the slope of one of the lines given by  $a^2x^2 + 2hxy + b^2y^2 = 0$  is three times the other, then h =  
 a)  $\frac{2}{\sqrt{3}}ab$       b)  $2a^2b^2$       c)  $4ab$       d)  $\frac{\sqrt{3}}{2}ab$
- 99) If the circles  $x^2 + y^2 - 9 = 0$  and  $x^2 + y^2 + 2ax + 2y + 1 = 0$  touch each other externally, then a =  
 a) -4/3      b) 1      c) 3/4      d) 1/3
- 100) The angle of intersection between the curves  $y^2 = 4x$  and  $x^2 = 32y$  at the point (16, 8) is:  
 a)  $\pi/2$       b)  $\tan^{-1}(1/3)$       c)  $\tan^{-1}(3/5)$       d)  $\pi/4$