Consortium of Medical Engineering and Dental Colleges of Karnataka

(COMEDK-2011)

1. The height y and distance x along the horizontal plane of projectile on a certain planet (with no surrounding) are given by :

$y = (8t - 5t^2)$ metre and $x = 6t$ metre

where t is in second. The velocity with which the projectile is projected is :

(a) 8 m/s (b) 6 m/s
(c) 10 m/s (d) data is not sufficient

2. A body of mass a, moving with a velocity b collides with a body of mass c, at rest and sticks to it. They move together with a velocity given by :

(a) $\frac{ac}{a+b}$ (b) $\frac{ab}{a+c}$
(c) $\frac{a+b}{ac}$ (d) $\frac{b+c}{ab}$

3. The refractive index of a material is given by the equation $n = \frac{A+B}{\lambda^2}$, where A and B are constants. The dimensional formula for B is

(a) $[M^0L^2T^{-1}]$ (b) $[M^0L^{-2}T^0]$
(c) $[M^0L^2T^{-2}]$ (d) $[M^0L^2T^0]$

4. A satellite is orbiting around the earth. By what percentage should we increase its velocity, so as to enable it escape away from the earth ?

(a) 41.4% (b) 50%
(c) 82.8% (d) 100%

5. At what temperature, the hydrogen molecule will escape from earth's surface ?

(a) 10^1 K (b) 10^2 K
(c) 10^3 K (d) 10^4 K

6. If the earth is at one-fourth of its present distance from the sun, the duration of the year will be :

(a) half the present year
(b) one-eighth the present year
(c) one-fourth the present year
(d) one-sixth the present year

7. An observer moves towards a stationary source of sound with a velocity one-tenth the velocity of sound. The apparent increase in frequency is :

(a) zero (b) 10%
(c) 5% (d) 0.1%

8. When two conductors of charges and potentials C_1, V_1 and C_2, V_2 respectively are joined, the common potential will be

(a) $\frac{C_1V_1 + C_2V_2}{V_1 + V_2}$ (b) $\frac{C_1V_1^2 + C_2V_2^2}{V_1^2 + V_2^2}$
(c) $C_1 + C_2$ (d) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

9. A weightless thread can bear tension upto 3.7 kg-wt. A stone of mass 500 g is tied to it and revolved in a circular path of radius 4 m in a vertical plane. If $g = 10\ ms^{-2}$, then the maximum angular velocity of the stone will be :

(a) 4 rad/s (b) 16 rad/s
(c) $\sqrt{21}$ rad/s (d) 2 rad/s

10. The effective length of a magnet is 31.4 cm and its pole strength is 0.5 Am. If it is bent in the form of semicircle, what will be its magnetic moment then ?

(a) 0.12 Am^2 (b) 0.1 Am^2
(c) 0.05 Am^2 (d) 0.01 Am^2

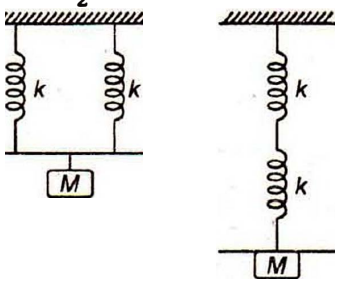
11. Four molecules of a gas have speeds 1, 2, 3 and 4 kms^{-1}. The value of rms speed of the gas molecules is :

(a) $\frac{1}{2}\sqrt{15}\ kms^{-1}$ (b) $\frac{1}{2}\sqrt{10}\ kms^{-1}$
(c) 2.5 kms^{-1} (d) $\sqrt{\frac{15}{2}}\ kms^{-1}$

12. If there is change of angular momentum from J to $5J$ in 5 s, then the torque is

(a) $\frac{3J}{5}$ (b) $\frac{4J}{5}$
(c) $\frac{5J}{4}$ (d) none of these

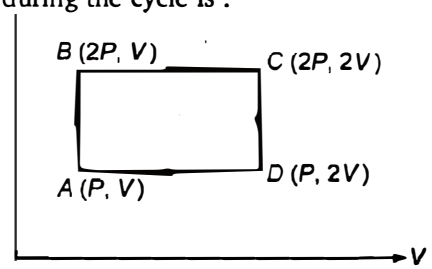
13. Two springs having force constants k each are arranged in parallel and in series. A mass M is attached to two arrangements separately. If time period in first case is T_1 and in second case is T_2, then ratio $\frac{T_1}{T_2}$ is :



(a) 1.5 (b) 3.2
(c) 0.5 (d) 2.1

14. If the work done in blowing a bubble of volume V is W, then the work done in blowing a soap bubble of volume $2V$ will be
(a) W (b) $2W$
(c) $\sqrt{2}W$ (d) $4^{1/3}W$

15. An ideal monoatomic gas is taken round the cycle $ABCDA$ as shown in figure. The work done during the cycle is :



(a) PV (b) $2PV$
(c) $\frac{PV}{2}$ (d) zero

16. A proton of energy 2 MeV is moving in a circular path in a magnetic field. What should be the energy of a deuteron, so that it also describes circular path of radius equal to that of the proton ?
(a) 1 MeV (b) 2 MeV
(c) 4 MeV (d) 0.5 MeV

17. A gas at NTP is suddenly compressed to one-fourth of its original volume. If γ is supposed to be 3/2, then the final pressure is :
(a) 4 atm (b) $\frac{1}{2}$ atm
(c) 8 atm (d) $\frac{1}{4}$ atm

18. In a series combination $R = 300\,\Omega$, $L = 0.9$ H, $C = 2.0\,\mu$F, $\omega = 1000$ rad/s, the impedance of the circuit is :
(a) $1300\,\Omega$ (b) $900\,\Omega$
(c) $500\,\Omega$ (d) $400\,\Omega$

19. n identical spherical drops each of radius r are charged to same potential V. They combine to form a bigger drop. The potential of the big drop will be
(a) $n^{1/3}V$ (b) $n^{2/3}V$
(c) V (d) nV

20. The wavelength of maximum energy, released during an atomic explosion was 2.93×10^{-10} m. Given that the Wien's constant is 2.93×10^{-3} m-K, the maximum temperature attained must be of the order of :
(a) 10^{-7} K (b) 10^{7} K
(c) 10^{-3} K (d) 5.86×10^{7} K

21. The pressure and density of a diatomic gas $\left(\gamma = \frac{7}{5}\right)$ change adiabatically from (P, d) to (P', d'). If $\frac{d'}{d} = 32$, then $\frac{P'}{P}$ should be :
(a) $\frac{1}{128}$ (b) 32
(c) 128 (d) none of these

22. A piece of wax weighs 18.03 g in air. A piece of metal is found to weigh 17.03 g in water. It is tied to the wax and both together weigh 15.23 g in water. Then, the specific gravity of wax is :
(a) $\frac{18.03}{17.03}$ (b) $\frac{17.03}{18.03}$
(c) $\frac{18.03}{19.83}$ (d) $\frac{15.03}{17.03}$

23. If a mica sheet of thickness t and refractive index μ is placed in the path of one of interfering beams in a double slit experiment, then displacement of fringes will be
(a) $\frac{D}{d}\mu t$ (b) $\frac{D}{d}(\mu - 1)t$
(c) $\frac{D}{d}(\mu + 1)t$ (d) $\frac{D}{d}(\mu^2 - 1)t$

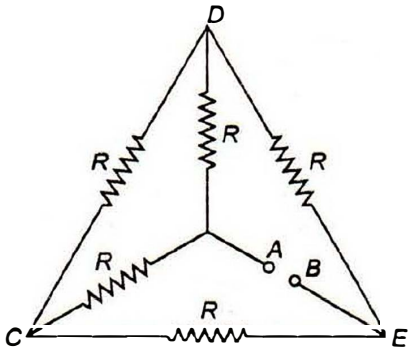
24. A ray of light propagates from glass (refractive index $= \frac{3}{2}$) to water (refractive index $= \frac{4}{3}$). The value of the critical angle is :
(a) $\sin^{-1}\left(\frac{1}{2}\right)$ (b) $\sin^{-1}\left(\sqrt{\frac{9}{8}}\right)$
(c) $\sin^{-1}\left(\frac{8}{9}\right)$ (d) $\sin^{-1}\left(\frac{5}{7}\right)$

25. A ray of light suffers minimum deviation when incident at 60° prism of refractive index $\sqrt{2}$. The angle of incidence is

(a) $\sin^{-1}(0.8)$ (b) 60°

(c) 45° (d) 30°

26. Each of the resistance in the network shown in figure is equal to R. Find the equivalent resistance between two terminals A and B.



(a) R (b) $5R$

(c) $2R$ (d) $\frac{2}{3}R$

27. A gas in an air tight container is heated from 25°C to 90°C. The density of gas will :

(a) increase slightly

(b) remain the same

(c) increase considerably

(d) decrease slightly

28. If 2% of the main current is to be passed through the galvanometer of resistance G, the resistance of the shunt required is

(a) $\frac{G}{49}$ (b) $\frac{G}{50}$

(c) $49\,G$ (d) $50\,G$

29. The current in self-inductance $L = 40$ mH is increased uniformly from 1 A to 11 A in 4 milliseconds. The induced emf produced in L during this process will be

(a) 100 V (b) 0.2 V

(c) 440 V (d) 40 V

30. H^+, He^{2+} and O^{2-} all having the same kinetic energy pass through a region in which there is a uniform magnetic field perpendicular to their velocity. The masses of H^+, He^{2+} and O^{2-} are 1 amu, 4 amu and 16 amu, respectively. Then :

(a) H^+ will be deflected most

(b) O^{2-} will be deflected most

(c) He^{2+} and O^{2-} will be deflected most

(d) all will be deflected most

31. The current gain of a transistor in common emitter mode is 49. The change in collector current and emitter current corresponding to the change in base current by 5.0 μA are :

(a) $\Delta i_C = 245\,\mu A$, $\Delta i_E = 250\,\mu A$

(b) $\Delta i_C = 252\,\mu A$, $\Delta i_E = 145\,\mu A$

(c) $\Delta i_C = 125\,\mu A$, $\Delta i_E = 250\,\mu A$

(d) $\Delta i_C = 252\,\mu A$, $\Delta i_E = 230\,\mu A$

32. In hydrogen atom when an electron jumps from second to first orbit, the wavelength of line emitted is :

(a) 0.563 Å (b) 4861 Å

(c) 4102 Å (d) 1213 Å

33. How does the magnetic susceptibility χ of a paramagnetic material change with absolute temperature T ?

(a) $\chi \propto T$ (b) $\chi \propto T^{-1}$

(c) χ = constant (d) $\chi \propto e^T$

34. Two identical heaters of 220 V, 1000 W are placed in parallel with each other across 220 V line, then the combined power is

(a) 1000 W (b) 2000 W

(c) 500 W (d) 4000 W

35. A bar of magnetic moment M is cut into two parts of equal length. The magnetic moment of either part is :

(a) M (b) $2M$

(c) $\frac{M}{2}$ (d) zero

36. A rain drop of radius 0.3 mm has a terminal velocity of 1 m/s and the viscosity of 1 m/s and the viscosity of air is 18×10^{-5} poise. The viscous force on the drop is :

(a) 16.95×10^{-9} N (b) 1.695×10^{-9} N

(c) 10.17×10^{-9} N (d) 101.74×10^{-9} N

37. If magnetic material moves from stronger to weaker parts of magnetic field, then it is known as :

(a) anti-ferromagnetic

(b) ferromagnetic

(c) diamagnetic

(d) paramagnetic

38. A charge q is placed at the centre of line joining two equal charges Q. The system of three charges will be in equilibrium, if q is equal to :

(a) $-\frac{Q}{2}$ (b) $-\frac{Q}{4}$

(c) $+\frac{Q}{4}$ (d) $+\frac{Q}{2}$

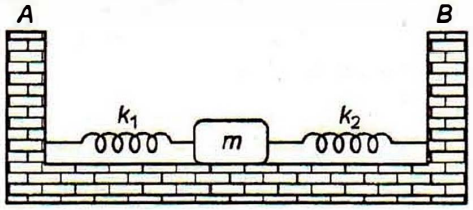
39. The temperature of cold, hot junction of a thermocouple are 0°C and T°C respectively. The thermo-emf produced is $E = AT - \frac{1}{2}BT^2$

If $A = 16$, $B = 0.08$, the temperature of inversion will be :

(a) 100°C (b) 300°C

(c) 400°C (d) 500°C

40. Two light springs of force constants k_1 and k_2 and a block of mass m are in one line AB on a smooth horizontal table, such that one end of each spring is fixed to rigid support and other end is attached to block of mass m kg as shown in figure. The frequency of vibration is :



(a) $n = \frac{1}{2\pi}\sqrt{\frac{k_1 + k_2}{m}}$ (b) $n = \frac{1}{2\pi}\sqrt{\frac{k_1 k_2}{m}}$

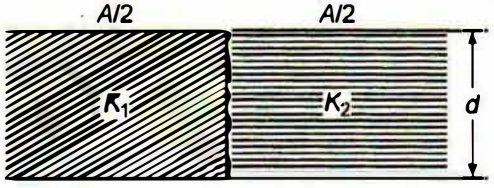
(c) $n = \frac{1}{2\pi}\sqrt{\frac{k_1 - k_2}{m}}$ (d) none of these

41. Pressure inside two soap bubbles are 1.01 and 1.02 atm. Ratio between their volumes is :

(a) 102 : 101 (b) $(102)^3 : (103)^3$

(c) 8 : 1 (d) 2 : 1

42. Two dielectrics of dielectric constants K_1 and K_2 are filled in gap of parallel plate capacitor as shown in figure



The capacitance of capacitor will be :

(a) $\frac{\varepsilon_0 A(K_1 + K_2)}{2d}$ (b) $\frac{\varepsilon_0 A}{2d}\left(\frac{K_1 + K_2}{K_1 K_2}\right)$

(c) $\frac{\varepsilon_0}{d}\left(\frac{K_1 K_2}{K_1 + K_2}\right)$ (d) $\frac{\varepsilon_0 A}{d}\left(\frac{K_1 + K_2}{K_1 K_2}\right)$

43. For a series LCR circuit, the phase difference between current and voltage at the condition of resonance will be :

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$

(c) zero (d) nothing can be said

44. A metallic rod of length l is placed normal to the magnetic field B and revolved in a circular path about one of the ends with angular frequency ω. The potential difference across the ends will be :

(a) $\frac{1}{2}B^2 l\omega$ (b) $\frac{1}{2}B\omega l^2$

(c) $\frac{1}{8}B\omega l^3$ (d) $B\omega l^2$

45. A magnetic needle suspended in a vertical plane at 30° from the magnetic meridian makes an angle 45° with the horizontal. What will be the true angle of dip ?

(a) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (b) $\tan^{-1}(\sqrt{3})$

(c) 45° (d) 30°

46. A force F is given by $F = at + bt^2$, where t is time. What are the dimensions of a and b respectively ?

(a) $[MLT^{-1}]$ and $[MLT^{-4}]$

(b) $[MLT^{-3}]$ and $[MLT^{-4}]$

(c) $[MLT^{-4}]$ and $[MLT^2]$

(d) $[ML^2T^3]$ and $[M^{-1}L^2T]$

47. In a triode valve, the plate resistance is 10000 Ω and the anode load resistance is 30000 Ω. If the amplification factor is 36, then the voltage gain is :

(a) 9 (b) 27

(c) 36 (d) 108

48. g_e and g_p denote the acceleration due to gravity on the surface of the earth and another planet whose mass and radius are twice to that of the earth, then :

(a) $g_p = \frac{g_e}{2}$ (b) $g_p = g_e$

(c) $g_p = 2g_e$ (d) $g_p = \frac{g_e}{\sqrt{2}}$

49. Of the following which relation is true :

(a) $\beta > \alpha$ (b) $\alpha > \beta$

(c) $\alpha\beta = 1$ (d) $\alpha = \beta$

50. A soap bubble in vacuum has a radius 3 cm and another soap bubble in vacuum has radius 4 cm. If two bubbles coalesce under isothermal condition, then the radius of the new bubble will be :

(a) 7 cm (b) 5 cm

(c) 4.5 cm (d) 2.3 cm

Answer – Key

1.	c	**2.**	b	**3.**	d	**4.**	a	**5.**	d	**6.**	b	**7.**	b	**8.**	d	**9.**	a	**10.**	b
11.	d	**12.**	b	**13.**	c	**14.**	d	**15.**	a	**16.**	a	**17.**	c	**18.**	c	**19.**	b	**20.**	b
21.	c	**22.**	c	**23.**	b	**24.**	c	**25.**	c	**26.**	a	**27.**	d	**28.**	a	**29.**	a	**30.**	a
31.	a	**32.**	d	**33.**	b	**34.**	b	**35.**	c	**36.**	d	**37.**	c	**38.**	b	**39.**	c	**40.**	a
41.	c	**42.**	a	**43.**	c	**44.**	b	**45.**	a	**46.**	b	**47.**	b	**48.**	a	**49.**	a	**50.**	b