**AIEEE Previous Years Papers Solutions**

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| [AIEEE Paper](http://www.askiitians.com/aieee/AIEEE-Past-Papers) > 2007-Physics Solutions**AIEEE 2007 Physics Answers and Solutions**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**ANSWERS**

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| 1) 1 | 2) 2 | 3) 2 | 4) 4 |
| 5) 4 | 6) 3 | 7) 3 | 8) 2 |
| 9) 2 | 10) 4 | 11) 4 | 12) 2 |
| 13) 3 | 14) 4 | 15) 4 | 16) 2 |
| 17) 2 | 18) 4 | 19) 1 | 20) 4 |
| 21) 3 | 22) 3 | 23) 3 | 24) 3 |
| 25) 4 | 26) 4 | 27) 1 | 28) 2 |
| 29) 3 | 30) 4 | 31) 1 | 32) 1 |
| 33) 1 | 34) 3 | 35) 1 | 36) 4 |
| 37) 4 | 38) 4 | 39) 1 | 40) 1 |

 **Some Important Hints and Solutions:****1**x = 2 X 10-2 cos πt    Differentiating both side    => dx/dt = -0.02πsinπt    => v = -0.02π sinπt    => v is maximum when, πt = π/2    => t = 1/2 = 0.5 sec **2** In AC circuit average power is :    Pavg = VrmsIrms cosφ     In AC circuit voltage and current is represented as:    V = V0sin(ωt+φ)    I = I0sin(ωt)     So, φ = -π/2 = -90°    So, Pavg = VrmsIrms cos(-90°)    So, Pavg = 0 **3** Distance between point A and origin(0,0) = 2   Distance between point B and origin(0,0) = 2   As the distance from the electric charge of A and B are same   so both A and B will have same potential.   So potential difference between point A an B will be = 0 **4** Q = charge on the capacitor = CV   Work done by battery = Q.V = CV2   Energy stored in capacitor = (1/2)CV2    So, (Energy stored in capacitor)/(Work done by battery) = 1/2 **5**I=I0[1-e-Rt/L]   I0 = 5/5 = 1   So, I=1-e-5t/10   => I=1-e-t/2    As t=2, so   I=1-e-1**6. Magnetic Field around a wire (B1) when r is greater than the radius of the wire.**B1 = μ0I/2 π rwhere I = current r = distance from wire and r ≥ Radius of the wire**Magnetic Field around a wire (B2) when r is less than the radius of the wire.**B2 = μ0Ir/2 π R2where I = current R = radius of wire r = distance from wire and r ≤ Radius of the wire (R)B2 = μ0Ia/4 π a2B1 = μ0I/4 π aSo, B2/B1 = 1 **7.** If electric current flowing through a hollow pipe, it will induce a magnetic field outside the pipe.The magnetic field inside the pipe will be zero because a closed loop just inside the pipe will not have any current flowing through it.This situation is similar to a Faraday cage where the electric field inside a hollow conducting shell is zero. **8.**Nuclear binding energy = [mass of nucleus - mass of nucleons].C Nuclear binding energy = (M0 - 8 MP - 9 MN) C2 **9.** Gamma ray is aform electromagnetic radiation. It is produced by sub-atomic particle interactions, such as electron-positron annihilation or radioactive decay. It does does not involve any change in proton number or neutron number **10.**In the first half cycle, the diode is in forward biased. In the next half-cycle, the diode is in reverse biased Diode is forward biased in first half-cycle. Voltage applied: 10 V (it difference the peak ie. +5V and -5V) So the amplitude of signal: 5V. **11.  Relation between energy and frequency**E = hν where  E = Energy  h = Planck's constant  ν = frequency **As per de Broglie equation** λ = h/mv where  p = momentum λ   = wavelength  h = Planck's constant  v = velocity By solving above two equation  p = hν/c **12.****integration-1** **13.** Using perpendicular Axis Theorem:  IAC = IEF  **14.**   x = x0 cos (ω t - π/4)dx/dt = v = -x0ωsin(ωt-π/4)dv/dt = a = -x0ω2cos(ωt-π/4)a = x0ω2cos(ωt+3π/4)By comparing it with , a = A cos (ω t + δ )A = x0ω2δ = 3π/4 **15.**Electric field (E) is vector quantity.Electric Potential (V) is scalar quantity.By changing the charge Electric Potential (V) do not change, but the direction of Electric field (E) changes. **16.  Half life of radioactive element**t1/2 = ln(2)/λ**Average life of radioactive element**τ = 1/λSo, x = 1/λyln(2)/λ So, 1.4λx = λyλx < λySo element Y will decay faster than element X **17**.  **Efficiency of Carnot cycle**η =  1 - Tc/ThW = η.Q where Q=total energy put into system=> 10=(1/10)Q=> Q = 100=> So energy absorbed by the system = (total energy put into system)-(Work done)=> energy absorbed by the system = 100-10 = 90 **19 .** Magnetic force acting on charge = **Fm** = q **v** x **B**Electric force acting on charge = **Fe** = q **E**So, q **v** x **B** = q **E**=> q **v** x **B** = q **E**=> **v** =(**E** x **B**)/B2  **20.** V(x) = 20/x2-4E = -dV/dx = 20/(x2-4)2  (2x-0) = 160/144 = 10/9  (+ve) **21.   Emitting Photons(Rydberg Formula)**Ephoton = E0(1/n12 -1/n22)where n1 < n2E0 = 13.6 eVBy using above formula E is maximum when n=2 to n=1As, E=hνSo ν is maximum if E is maximum. **22.** Assuming acceleration of both blocks are: aa = F/M+mSo force acting on m = Fm = Fm/M+m**23.** P = P1+P2 = -15+5=-10The focal length of the combination = 1/P = -1/10 m = -10cm **24.**Assume that the temperature at the interface = T(T1-T)k1/l1 = (T-T2)k2 /l2By solving above equation, T = T1k1l2+T2k2l1 / k1l2+k2l1 **25.** Sound intensity is sound power Pac per unit area ASound intensity I = 10log10(I/I0)B1 = 10log10(I1/I0)B2 = 10log10(I2/I0)B1-B1=2020 = 10log10(I1/I2)=> 2 = log10(I1/I2)=> I1/I2 = 100=> I1 = 100I2 **26.** cp - cv = R [for one mole of gas]=> cp - cv = R [for one 28 gm of nitrogen gas]=> cp - cv = R/28 [for one 1 gm of nitrogen gas] **27.** Force acting on the particle = **F** = q **v** x **B**The force acts perpendicular to the velocity so there is no work done on particle. So kinetic energy will not change.As force acts on the particle so there is change in its momentum **28.** action-of-forceForce acting at a distance d from O, due to wire AOB = F1 = μ0I1/2 π dForce acting at a distance d from O, due to wire COD = F2 = μ0I2/2 π dF1 and F2 are perpendicular to each other, So net force will beμ0/2 π d ( I12 + I22 )½ **29.**5=R0(1+50α) ..................... (i)6=R0(1+100α) ..................... (ii)By solving (i) and (ii)α = 1/200R0 = 4Ω **30.**Net work done by the system is zero because there is no change in energy of the system. **31.**Net work done by the system is zero because there is no change in energy of the system. **32.** Let mass of the circular disc = MSo mass of the removed disc = M/4So mass of the remaining desc = 3M/4Assume that centre of mass of remaining disc is at a distance x from centreSo, (3M/4).x = (M/4).R=> x = R/3 = αR=> α = 1/3**33.** angular-accelerationAssume that acceleration = aSo angular acceleration = a/Rmgsinθ - f = ma .............. (i)fR = I(a/R) ....................... (ii)By solving (i) and (ii)g sin θ/1 + (I/(MR2)) **34.** The direction of the force that acts on the rotating particle passes thru the center. So there is no torque acting on the particle. As **no torque** acts on the particle so angular momentum is constant. **35.** Assume that spring is compressed by distance=xKinetic energy of the block = (1/2)×2×42 = 16While compressing the spring, energy loss due to friction = 10xEnergy transferred to spring due to block = (1/2)×10000×x2(1/2)×10000×x2 + 10x = 16 ...................(i)By solving equation (i), x = 5.5 (approx.) **36.** Kinetic energy of the particle at the beginning : K = (1/2)mv2Horizontal velocity of the particle = vcos60° Kinetic energy of the particle at the beginning : K = (1/2)mv2Kinetic energy of the particle at the hightest point = (1/2)m(vcos60°)2Kinetic energy of the particle at the hightest point = (1/2)mv2cos260° = K/4 **37.** Now, I/I0 = cos2φ/2 = cos2(2π/λ)(λ/12) = cos230°I/I0 = 3/4 **38.** **calculating-values**  **39.** As per the first law of thermodynamics :ΔQ = ΔU + ΔWFor the route iaf, 50 = 20 + ΔUΔU = 30For the route ibf, 36 = ΔW + 30ΔW = 6 **40.** Kinetic Energy = (1/2)mω2a2sin2ωtand ω = 2πνkinetic-energy Kinetic Energy = π2ma2ν2 |