$T = \frac{0.158\,V}{A}$ $\alpha S =$ $\alpha S_1 =$ $\alpha S_2 =$

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Physics

Semester: Fall

Year : 2013
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) What is wave motion? Derive an expression for the intensity of plane progressive wave along a stretched string. 9
   b) The time of reverberation of an empty hall without and with 500 audiences is 1.5s and 1.4s respectively. Find the reverberation time with 800 audiences in the hall. 6

$T = \frac{0.1658V}{A}$ ← volume of aud ← total absorption

2. a) Define coherent source. Derive the maximum and minimum intensity with the help of analytical treatment of interference of light wave. 9
   b) The balance wheel of watch oscillates with an angular amplitude of π radian and a period of 0.5 sec. Find: 6
      i. Maximum angular speed of wheel.
      ii. The angular acceleration of wheel when the displacement is $\pi/2$ radian.

$\Rightarrow \Omega_m = \omega\theta_m$

$\Rightarrow \Omega = \omega\sqrt{\theta_m^2 - \theta^2}$

3. a) Find the potential and field due to electric quadrupole. 9
   b) A 200 mm long tube containing 48 cm^3 of sugar produces an optical rotation of 11° when placed in a Saccharimeter. If the specific rotation of sugar solution is 66°, calculate the quantity of sugar contained in the tube in the form of a solution. 6

$S = \frac{100\,\theta}{lC}$

4. a) State Biot's and savart's law and use it to find the magnetic field at a point on the infinite length of wire. 9
   b) What is the magnitude of a point charge chosen so that the electric field 50cm away has the magnitude of 2N/C? 6

5. a) Show that $C = \frac{Em}{Bm}$ where symbols have their usual meaning. 5
   b) Show that B at the center of rectangle of length l and width d, carrying a current 'i' is given by $B = \frac{2\mu_0 i\,(l^2+d^2)^{1/2}}{\pi\quad ld}$. 5

c) Derive continuity equation using Maxwell's equations. 5

6. a) What is wave function? Derive the Schrodinger time dependent wave equation for a free particle like electron. 9

b) Explain the electrical conduction in metals, insulators and semiconductor according to band theory. 6

7. Write short notes on: (Any two) 2×5

a) Propagation of light wave through fiber.

b) Magnetic energy density.

c) Displacement Current.

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Attempt all the questions.

1. a) Derive the equation of simple harmonic motion in different form and calculate the velocity and acceleration of a body with the help of the solution of this equation. 9

   b) Calculate the wave length, frequency, speed of the wave and maximum particle velocity in the wave represented by $y = 20 \sin\pi (2t - 0.05 x)$ .The values of x and y are in centimetres. 6

2. a) Discuss the interference in thin films due to reflection and obtain the condition for bright and dark fringes. 9

   b) What is reverberation and reverberation time? Derive Sabines reverberation formula. 6

   OR

   Calculate the frequency and maximum particle velocity due to wave represented by $y(x, t) = 0.03 \sin (60\pi t - o.o3\pi x)$. The values of x and y are in centimeters.

3. a) What is electric flux? State Gauss Law in electrostatics and explain two applications of Gauss Law. 9

   b) What is the highest order speed which may be seen with monochromatic light of wave length 6000 A^0 by means of a diffracting grating with 5000 lines/cm. 6

4. a) Explain Biot and Savart's law. Use it to find the magnetic field at any point inside the solenoid. 9

   b) A circular loop of wire 5 cm of radius carries a current of 100 amps. What is the energy density at the centre of the loop? 6

5. a) What are Maxwells equation? Convert the integral form of Maxwells equation in its different form. 9

b) Using Maxwell's equation, prove that $C = \frac{Em}{Bm}$ where symbols carry their usual meaning. 6

6. a) Explain physical significance of wave function ψ. Discuss and find the Eigen function of the particle travelling in one dimensional box of infinite height. 9

OR

Explain Doppler's effect taking all three conditions and mention it's limitation also:

i. Observer moving but source at rest
ii. Source moving but observer at rest
iii. Both source and observer are moving.

b) A parallel plate capacitor has a capacitance of 100×10^{-12} F, a plate area of $100cm^2$ mica is used as a dielectric. At 50 Volts p.d, calculate electric field intensity and magnitude of induced charge. 6

7. Write short notes on: ***(Any Two)*** 2×

a) Optical fibre and its advantages
b) N-type and p-type semiconductor
c) Describe about the spontaneous and stimulated emission of radiation.
d) Displacement current.