POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Physics

Semester: Fall

Year : 2017
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) Why compound pendulum is preferred than simple pendulum? Obtain time period of a bar pendulum and hence show that centre of oscillation and centre of suspension can be interchanged. 9

   b) A sinusoidal wave travels along a string. The time for a particular point to move from maximum displacement to zero is 0.17 s. What are the 6

      i. Period and frequency?
      ii. The wavelength is 1.40m; what is the wave speed?

2. a) What is interference and why are coherent sources necessary for interference? Explain necessary theory for Newton's rings method to determine the wavelength of monochromatic light. How can we get the centre of the rings bright? 9

   b) Deduce the missing orders in Fraunhoffer's double slit diffraction experiment in which slit width a=0.08mm and opaque width b=0.16mm. 6

3. a) Define quadrupole moment and derive the expression for potential at a point when point does not lie along a axis of quadrupole. 9

   b) A parallel plate capacitor has circular plates of 8 cm radius and 1 mm separation. What charge will appear on the plates if a p.d. of 100 volt is applied? 6

4. a) Compare Ampere's law with Biot – Savert law. Use Biot - Savert law to calculate the magnitude of magnetic field strength due to current carrying solenoid at any point. 9

   b) Show that ratio of electric field strength and magnetic field strength is equal to speed of light hence calculate maximum value of magnetic 6

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field and average intensity of light, if the maximum electric field at a distance of 10m from an isotropic light source is 2 V/m,

5. a) Using Schrodinger's wave equation obtain energy and wave-function of a particle confined in infinite potential well. 9

b) What are the

i. Mean time between collisions? 6

ii. The mean free path for free electrons in copper? (Given $n=8.4\times10^{28}m^{-3}$, $\rho=1.7\times10^{-8}\Omega m$, $v_{avg}=1.6\times10^{6}$ m/s.)

6. a) Discuss the LC oscillation. Hence prove that the frequency of oscillation is $f=\frac{1}{2\pi\sqrt{LC}}$. Is this real or ideal explain? 9

b) Discuss the factor reverberation for quality control of sound in public buildings. How it is different from echo. 6

7. Write short notes on: **(Any two)** 2x5

a) Optical fibre and its uses

b) Explain knee voltage and junction breakdown

c) Time constant in LR circuit

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1. a) Discuss different types of oscillations and hence determine the time period of compound pendulum and compare it with time period of simple pendulum. 9

   b) Two progressive waves of equal amplitude and frequency travelling in opposite direction superimpose to each other so as to form a standing wave of equation $y = Acosksinwt$. Where A=1mm, k=1.57cm^{-1} and w=78.5sec^{-1}. Find: 6

      i. Velocity of progressive wave
      ii. Node closet to the origin, X>0
      iii. Antinode closet to the origin, X>0
      iv. Amplitude of resultant wave when, X=2.33cm.

2. a) What are the difference between interference and diffraction? Explain the phenomenon of interference in thin film by refracted rays. 9

   b) A diffraction grating 20.0mm wide has 6000 rulings 6

      i. Calculate grating element
      ii. At what angles will intensity maxima occur on a viewing screen if the radiation incident on the grating has wave length of 589nm?

3. a) Write the circuit equation for a charging RC circuit. Solve it to find charge and current. Explain the meaning of time constant. Provide qualitative sketch for charge and current varying with time. 9

   b) Show that electric potential at a point due to short dipole is inversely proportional to the square of distance from center of dipole. 6

4. a) Describe about Hall-effect with its application. Derive an expression for Hall coefficient, Hall Voltage and establish the relation with 9

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mobility of charge carriers and conductivity of the material of wire.

b) Using Biot-Savart's law, find the magnetic field strength at the center of a rectangle loop of wire of length L. ? 6

5. a) What do you mean by electromagnetic oscillation? Derive the frequency of electromagnetic oscillation in LCR circuit. 9

b) A certain radio station broadcasts at a frequency of 1020 kHz. At a point some distance from the transmitter, the maximum magnetic field of the electromagnetic wave emits is found to be 1.6×10^{-6} T. 6

i. What is the speed of propagation of wave?

ii. What is the wavelength?

iii. What is the maximum electric field?

6. a) What is wave function? Derive the expression for Schrodinger time independent wave equation, using time dependent wave equation. 9

b) What do you mean by semiconductor? Explain the terms intrinsic and extrinsic semiconductor. Classify extrinsic semiconductors on the basis of doping. 6

7. Write short notes on: (**Any two**) 2x5

a) Production of ultrasound by magnetostriction method

b) Working principle of optical fiber

c) Lorentz force with an example