

Mid-West University
Examinations Management Office
End-Semester Examinations -2080

Bachelor level/ B.E. Hydropower/ II Semester
Time: 3 hours
Subject: Engineering Physics (SH422/SH104)

Full Marks: 50
Pass Marks: 25

- Attempt all the questions
 - Figures in the margin indicate full marks.
 - Assume suitable values, with a stipulation, if necessary.
 - Candidates are required to answer the questions in their own words as far as possible.
1. a) Define torsional pendulum. Show that the motion of the torsional pendulum is angular simple harmonic motion and derive its period. (5)
b) Consider the solution of the differential equation in damped oscillation represented by $y = ae^{-\gamma t} \sin \omega t$. The equation for the displacement of a point on a damped oscillator is given by $y = 5e^{-0.25t} \sin(\pi/2)t$ meter. Find the velocity of oscillation at $t = T/4$ where T is the period of oscillation. (2.5)
c) A stationary wave is represented by $y = 0.2 \sin(2\pi x) \cos(4\pi t)$ where x , y , and t are in SI units. Calculate the distance between the successive antinodes. (2.5)
 2. a) What do you mean by Doppler's effect? Find the expression for apparent frequency of sound when an observer is at rest and the source is moving towards and away from observer. (5)
b) Two thin lenses of focal lengths 8cm each are identical and coaxially separated by 4cm. Determine the equivalent focal length of this lens combination to illustrate the principal points in the figure and also find the distance between two principal points. (3)
c) Define LASER with its uses. (2)
 3. a) What is the condition for diffraction of a wave? Discuss intensity distribution through single-slit diffraction. (5)
b) A 200mm long tube containing 48cm³ of sugar solution produces an optical rotation of 11° when placed on a saccharimeter. If the specific rotation of sugar is 66°. Calculate the quantity of sugar contained in the tube in the form of a solution. (2)
c) In a double slit experiment, the distance between slits is 5mm and the slits are 1m from the screen. Two interference patterns can be seen one due to light of wavelength 480nm and the other due to light of wavelength 600nm. What is the separation on the screen between the third-order bright fringes of two interference patterns? (3)
 4. a) Derive the expression of charging and discharging of the capacitor. (5)
b) Write Maxwell's equations in integral form and differential form. (3)
c) A circuit has $L=10\text{mH}$ and $C=1\mu\text{F}$. How much resistance should be added to the circuit so that the frequency of oscillation will be 10% less than that of free LC oscillation? (2)

5. a) Define the Hall effect. Derive the expression of Hall voltage, Hall mobility, and Hall Coefficient. (5)
- b) Along circular coil consisting of 100 turns with a diameter of 1.2m carries a current of 5A (a) Find the magnetic field of a point along the axis 80cm from the center. (b) At what distance from the center, along the axis, is the Field magnitude $\frac{1}{8}$ as great as at the center? (2.5)
- c) Two conductors are made of the same material and have the same length. Consider A is a solid wire of diameter 1mm, and conductor B is a hollow tube of outside and inside diameter 2mm and 1mm. Find the ratio of these two conductors measured between their ends. (2.5)

The End