

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Odd Mid Semester Examination for Academic Session 2025-26

COURSE NAME: B. Tech

SEMESTER: Ist

BRANCH NAME: Sections (M,N,O,P,Q,R S,T)

SUBJECT NAME: Physics

FULL MARKS: 30

TIME: 90 Minutes

Answer All Questions.

The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*

- Q1. [2 × 3]
 a) Define Relaxation time and logarithmic decrement in damped harmonic oscillation? - CO1
 b) The amplitude of a lightly damped oscillator decreases by 3.0% during each cycle. What percentage of the mechanical energy of the oscillator is lost in each cycle? - CO2
 c) Define coherence in light? Describe principle of superposition in light? - CO1/CO2
- Q2. [4+4]
 a) Show that the total energy of a Simple Harmonic Oscillator follows conservation law of energy?
 b) A block has mass $m = 2.72 \times 10^5$ kg and is designed to oscillate at frequency $f = 10$ Hz and with amplitude $x_m = 20.0$ cm. - CO1
 (i) What is the total mechanical energy E of the spring – block system?
 (ii) What is the block's speed as it passes through the equilibrium point?
 OR
- a) Set up the differential equation for Electrical Simple Harmonic Oscillator and Electrical Forced Oscillator. - CO1
 b) Define the Quality factor and bandwidth of series RLC? [4+4]
- Q3. [6+2]
 a) Starting from the experimental arrangement of the Newton's Ring apparatus, derive the formula for determination of wavelength of monochromatic light?
 b) In a Newton's ring experiment, the diameter of the 20th dark ring was found to be 5.82 mm and the 10th dark ring is 3.36 mm. If the radius of the plano convex lens is 1 m, Calculate the wavelength of light used? - CO2
 OR
- a) Discuss the phenomenon of interference in thin film and obtain the conditions for maxima and minima for oblique incident of light. - CO2
 b) A double-slit arrangement produces interference fringes for sodium light 589 nm that have an angular separation of 3.50×10^3 rad. For what wavelength would the angular separation be 10% greater? [6+2]
- Q4. [6+2]
 a) Describe a damped harmonic oscillation. Starting from Simple harmonic oscillator derive its wave solution. Derive the cases of low, moderate and over damping with diagram?
 b) How long does it take for the amplitude of the damped oscillations to drop to half its initial value? - CO1/CO2
 OR
- a) Describe the forced oscillations when the external driving force causing the driven oscillations. Find wave solution? - CO1/CO2
 b) Derive the condition for amplitude resonance and maximum amplitude at the resonance in Forced Harmonic Oscillations? [5+3]