VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT - I) - August 2024

Programme	:	**B.Tech**	Semester	:	**Fall 2024-25**
Course Title	:	**Engineering Physics**	Course Code	:	**BPHY101L**
School	:	**School of Advanced Sciences**	Slot	:	**C2+TC2**
Duration	:	**90 minutes**	Max. Marks	:	**50**
Class No.	:	**5973/5981/5989/5997/6004/6239/6250/6842/7420**			

Part – A (5 x 10 = 50)

Answer ALL Questions

Sl. No	Questions	Max Marks
1	*Write the assumptions to obtain the wave equation on a string stretched by a constant tension 'T'. Derive the wave equation with neat diagram. Show that the square of speed of wave is inversely proportional to linear mass density of the string.*	10
2	*a) What are the different types of waves? Briefly explain with proper examples.* *b) The bottom of a ship in the sea shoots SONAR waves straight down into the saltwater. After 3.8 sec, the signal reflects off the deep bottom bedrock and returns to the ship. When the ship reaches 175 km, it transmits another signal, which is received after 5.8 sec. Calculate the depth of the sea in each example, as well as the height difference between the two. Note velocity of sonar wave in sea water is 1450 m/s.*	5 5
3	*a) Write the reflection and transmission coefficient relations of wave at the boundary of two strings in terms of linear mass densities (ρ_1, ρ_2). Discuss the role of reflection and transmission coefficients if i) $\rho_1 = \rho_2$ ii) $\rho_1 > \rho_2$ iii) $\rho_1 < \rho_2$ iv) $\rho_2 \to \infty$.* *b) A string of length 5 m is fixed at both ends. If the mass is loaded in the string is 650 gram and mass of the string is 0.015 kg, find the speed, frequency and wavelength of a transverse wave in the string.*	5 5
4	*a) Write the integral form of Maxwell equations with proper vector symbol and discuss their significances.* *b) In Ampere's circuital law, why did Maxwell include the displacement current? Attain Maxwell's modification of Ampere's circuital law.*	5 5
5	*Write the Maxwell equations for free space. Derive wave equations for electric and magnetic field components of the EM wave in the same medium. Show that the velocity of EM wave in free space is equal to the velocity of light.*	10