### WIN2122UGFCAT1\_VL2021220505598\_BPHY101L\_MAF C (#37388)

Total Marks: 30 Total Duration: 60 minutes

### Instructions

#### **Basic Instructions**

- You can freely navigate between different questions forward and backward using Next and Previous buttons
- 2. Finish button will be enabled only towards the end of the exam.

#### Instructions for DESCRIPTIVE questions requiring SCAN & UPLOAD

- Make sure to upload your scans immediately after you answer every question. Do NOT wait till the end
  to avoid panic at the end.
- 2. The exam time is inclusive of time for scanning & uploading answers.
- 3. If using laptop + mobile for the exam, click on **Open Test** on laptop and click on **Scan & Upload** on mobile
- 4. If using **laptop + mobile** for the exam, when scanning and uploading from mobile, ensure that the correct question is open on the laptop.
- 5. When clicking on Camera button on a smart phone for scanning and uploading, you have 2 camera applications available to scan the answer: your phone's **native camera** and an alternative Low Memory Camera. Click on the **Low Memory Camera** in case your browser shows an error due to low memory.



Section: Module 1

Marks per question: 10

1 question(s) out of the 3 question(s) in this section will be shown to examinee

Examinee should answer all 1 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

Course Outcomes: CO1

Consider a transverse wave encountering a change in impedance of a medium in which it is travelling. Discuss its travel by deducing the reflection and transmission coefficients.

Q2 Difficulty Level: Easy

Knowledge Level: K1

Course Outcomes: CO1

Describe the standing wave pattern in a fixed length string. Obtain the frequency of first four harmonics with necessary diagram.

Q3 Difficulty Level: Easy

Knowledge Level: K1

Course Outcomes: CO1

Define normal and anomalous dispersion. Relate the phase velocity with group velocity in both cases. AJAMA PADHAI

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Section: Question 2 (5+5mark)

Marks per question: 10

1 question(s) out of the 3 question(s) in this section will be shown to examinee

Examinee should answer all 1 question(s) in this section

Q1 Difficulty Level: Hard

Knowledge Level: K1

Course Outcomes: CO1

Apply Fourier series to explain the superposition of waves.

The displacement of a particle of a string carrying a traveling wave is given by  $y = 3\sin 6.28(0.50x-50t)$ , where x is in cm and t in sec. Find a)the amplitude, b)the wavelength, c) the frequency and the d) speed of the wave.

Q2 Difficulty Level: Hard

Knowledge Level: K1

urse Outcomes: CO1

Identify the characteristics of a wave motion.

The equation for a wave traveling in x direction on a string is y = 3 cm sin[(3.14/cm)x - (314/s)t]. Find out the maximum velocity of a particle of the string. Also calculate the acceleration of a particle at x=6 cm and time t=0.11 s.

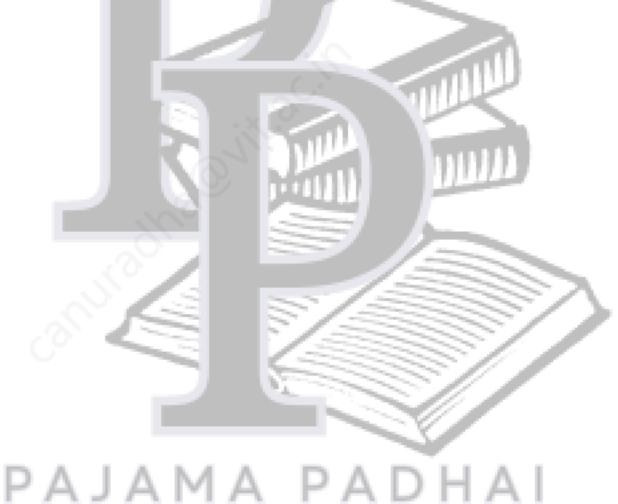
# PAJAMA PADHAI

Q3 Difficulty Level: Hard

Course Outcomes: CO1 Knowledge Level: K1

With sufficient examples and diagrams, relate longitudinal and transverse waves.

A 'wave-like' function is written as  $y = A(x) \cos x$ (100t), where the 'amplitude' is a function of position. Deduce the condition it should satisfy in order to be qualified as a wave.



Section: Question 3 (5+5mark)

Marks per question: 10

1 question(s) out of the 3 question(s) in this section will be shown to examinee

Examinee should answer all 1 question(s) in this section

Q1 Difficulty Level: Medium

Knowledge Level: K1

Course Outcomes: CO2

Explain divergence of a vector field. Infer the condition of positive, negative and zero divergence.

Find the volume charge density associated with a field using its displacement given by  $D = (xy^2)i +$  $(yx^2)j + zk C/m^2$ .

Q2 Difficulty Level: Medium

Knowledge Level: K1

Course Outcomes: CO2

Summarize Maxwell's equations in differential form.

Find the magnetic field B of electromagnetic waves in free space if the components of electric field are  $E_x = E_v = 0$  and  $E_z = E_0 \cos kx \sin wt$ .

# PAJAMA

Q3 Difficulty Level: Medium

Knowledge Level: K1 Course Outcomes: CO2

Discuss irrotational field. Show that it can be regarded as a field of gradient of a scalar.

Find displacement current density for the magnetic field given by  $H_x=0$ ,  $H_y=0$  and  $H_z=H_0\sin(wt-\beta x)$ . Assume the conduction current density to be zero.

