BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER: IV**
BRANCH: ECE **SESSION : SP/2020**

SUBJECT: EC257 ELECTROMAGNETIC FIELDS & WAVES

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.

				CO	BL
Q1	(a)	Analyze how Faraday's law links to the time varying Electric field and Magnetic field.	[2]	2	4
Q1	(b)	A conductor moves with a velocity $\vec{u} = 4.5 \sin 10^6 t\, \overrightarrow{a_z}$ m/s as shown in Figure. Find the induced voltage in conductor if (i) B = 0.08 $\overrightarrow{a_y}$ (ii) B = 0.08 $\overrightarrow{a_x}$	[3]	2,4	5

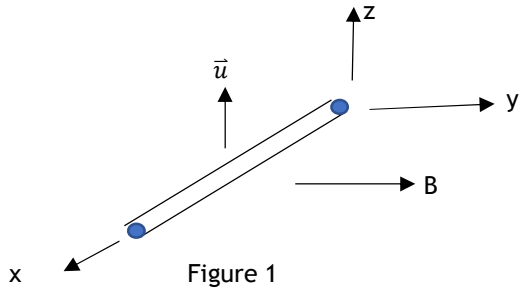

Figure 1

Q2	(a)	Is it possible to ignore the displacement current in a wire with conductivity of 2 X 10^7 S/m, relative permittivity as 1, which carries a conduction current I_c= 2 sin ωt ?	[2]	2,4	3
Q2	(b)	In a three dimensional space divided into region 1 with μ_{r1} = 3 and region 2 with μ_{r2} = 5, if the magnetic field in region 1 is given by H_1= 4.0 a_x + 1.5 a_y - 3 a_z A/m. Find magnitude of H_2 also specify the medium characteristics.	[3]	1,2,3	4
Q3	(a)	Specify the medium characteristics for (i) free space (ii) lossless dielectrics (iii) Lossy dielectrics and (iv) good conductors.	[2]	1,3	3
Q3	(b)	If $\vec{E} = \overrightarrow{E_s}\, e^{-j\beta z}$, plot and evaluate the polarization corresponding to (i) $\overrightarrow{E_s} = \hat{y}$ (ii) $\overrightarrow{E_s} = \hat{x} + 2\hat{y}$ (iii) $\overrightarrow{E_s} = \hat{x} - j\hat{y}$.	[3]	1,3	5
Q4	(a)	Analyze the condition when a standing wave is formed in medium 1 and a transmitted wave in medium 2.	[2]	1,3,4	4
Q4	(b)	The magnetic field, H of a plane wave has a magnitude of 5 mA/m in medium defined by ε_r = 4, and μ_r = 1. Characterize the medium and determine (i) average power flow (ii) the maximum energy density of the plane wave.	[3]	1,3,4	5
Q5	(a)	Justify the requirement of distributed element equivalent circuit for the analysis of transmission line.	[2]	1	2
Q5	(b)	Characterize a lossless transmission line and show that for a lossless transmission line, the phase velocity $u = c = 1/\sqrt{LC}$	[3]	1,4	3

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