BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER : IV/ADD**
BRANCH: ECE **SESSION : SP/2025**

SUBJECT: EC257 ELECTROMAGNETIC FIELD AND WAVES

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Write down the integral form of Time harmonic Maxwell' s equation assuming time factor $e^{j\omega t}$.(Mention the basic law also)	[2]	CO2	1
Q.1(b)	i)What is the basic difference between motional emf and transformer emf? ii)The interface between two dielectrics is defined by x=0 plane . For dielectric 1,x>0 ε_{r1} =3, while the dielectric 2, x<0 ε_{r2} =4. If the electric flux density in the region 1 is given by $D_1 = 2a_x+3a_y+4a_z$ C/m^2 ,Find D_2.	[1+2]	CO2	3
Q.2(a)	In a medium the conduction current density is given by $J=3.0\sin(\omega t-10z)a_y+\cos(\omega t-10z)a_z$ mA/m^2, Find the volume charge density.	[2]	CO1	3
Q.2(b)	Derive wave equation for time varying magnetic potential.	[3]	CO2	3
Q.3(a)	Define Complex permittivity of the medium. What is the significance of ($\sigma/\omega\varepsilon$) ratio.	[2]	CO3	2,3
Q.3(b)	The conducting of sea water ,σ=5mho/m, $\varepsilon_{r=80}$.What is the distance ,an EM wave can transmitted at 25KHZ and 25 MHZ, when the range correspond to 90% attenuation.	[3]	CO4	3,4
Q.4(a)	In a lossless medium μ_r=1, E=4sin ($2\pi x10^7t-0.8x)a_z$ V/m. Find ε_r , η and time average power carried by the wave.	[2]	CO1	3
Q.4(b)	State Poynting's Theorem and prove it .	[3]	CO3	2,3
Q.5(a)	Define Brewster Angle. Write down the expression of Brewster angle for parallel polarization	[2]	CO3	3,4
Q.5(b)	Derive the expression of reflection co-efficient for plane wave at normal incidence between two different media. (If medium 1 is perfect dielectric and medium 2 is perfect conductor).	[3]	CO4	3,4

::::::28/02/2025::::::E