DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Winter Examination-2023

Course: B. Tech. **Branch: Electronics & Telecommunication Engineering /Electronics and Communication Engineering** **Semester: V**

Subject Code & Name: Electromagnetic Field Theory (BTETC501)

Max Marks: 60 **Date: 01-01-24** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Transform each of following vector to cylindrical coordinates at point specified a) 5Ux at P($\rho = 4, \emptyset = 120^0$, z = –1) b) 4Ux – 2Uy – 4Uz at A (x = 2, y = 3, z = 5)	**Understand**	**6**
B)	State Divergence Theorem. Evaluate both sides of divergence theorem for the region r ≤ 1and if $\bar{A} = r\,Sin^2\,\theta\,Cos^2\,\emptyset\,\overline{ar}$	**Understand, Remember**	**6**
C)	Vectors A= 3Ux + 5Uy + 6Uz and B = 6Ux + 4Uy + 2Uz are situated at point P (x, y, z). Find a) $\bar{A} + \bar{B}$ b) $\bar{A}.\bar{B}$ c) $\bar{A}\,X\,\bar{B}$ d) angle between $\bar{A}$ *and* $\bar{B}$	**Understand**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Show that Magnetic Field Intensity at any point due to finite conductor carrying current I placed along Z axis is $\overline{H} = \frac{I}{4\rho\pi}(\sin\alpha 2 - \sin\alpha 1)\,\overline{a}\emptyset$ Where $\alpha 2, \alpha 1$ are the Inclination of Upper end and Lower end of current carrying conductor.	**Understand**	**6**
B)	Potential is given by $V = 2(x+1)^2(y+2)^2(z+2)^2$ Volts in free space. Calculate a) Potential b) $\overline{E}$ c) $\overline{D}$ d) ρ_v at point (1,2,3)	**Understand**	**6**
C)	State and Explain Ampere's circuital law. When can we use Ampere's circuital law to determine the magnetic field?	**Understand, Remember**	**6**
Q. 3	**Solve Any Two of the following.**		**12**
A)	Define the term Electric Field Intensity and Show that E = $-\nabla V$, If V & V+ dV be the potentially neighboring equipotential surfaces.	**Understand, Remember**	**6**
B)	In the region where $\sigma = 0, \epsilon r = 2.5, \mu r = 10$. Determine whether following pairs of field satisfy Maxwell's equation, $\overline{E} = 2y\,\overline{ay}, \overline{H} = 5x\overline{ax}$	**Understand**	**6**

C)	State and explain the basic Maxwell's Equations in its point and integral form with their proper significance.	**Understand, Remember**	**6**
Q.4	**Solve Any Two of the following.**		**12**
A)	Describe various types of transmission line and list out the application of transmission line	**Understand, Remember**	**6**
B)	An open wire transmission line has the following primary constants $R = 4\ \Omega/km$, $L = 3.5mH/km$, $C = 0.009\ \mu F/km$, $G = 0.29\ \mu\Omega^{-1}km^{-1}$ Determine: Z_0, α, β and phase velocity for frequency of operation 1 kHz	**Understand**	**6**
C)	Define: Propagation constant, characteristic impedance, reflection coefficient and VSWR	**Understand**	**6**
Q. 5	**Solve Any Two of the following.**		**12**
A)	State and derive Poynting's theorem. What is average power Density?	**Understand, Remember**	**6**
B)	For perfect conducting medium, Show that $\alpha = \beta = \sqrt{\pi f \mu \sigma}$	**Understand**	**6**
C)	A 6580 MHz uniform plane wave is propagating in material medium of $\epsilon r = 2.25$. If the amplitude of the electric field is 500 V/m and material is assumed to be lossless, Find: a) the phase constant b) the wavelength in medium c) the velocity of propagation d) the intrinsic impedance e) propagation constant f) the amplitude of magnetic field intensity	**Understand**	**6**

***** End *****