

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) Given two points C (-3,2,1) and D (5, 20 ⁰ , -70 ⁰) Find (i) Spherical co-ordinates of C (ii) Cartesian co-ordinates of D (iii) the distance from point C to D	Understand	6
B) State and explain the Coulomb's law and the superposition principle applied for the static charge distribution.	Understand, Remember	6
C) Given the Flux density , $\vec{D} = \frac{2 \cos \theta}{r^3} \vec{a}_r + \frac{\sin \theta}{r^3} \vec{a}_\theta$ C/m ³ Evaluate Both the sides of divergence theorem for region defined by $1 \leq r \leq 2$, $0 \leq \varphi \leq \pi/2$, $0 \leq \theta \leq \pi/2$	Understand, Remember	6
Q.2 Solve Any Two of the following.		12
A) Show that Potential at a point due to Electric dipole is $V = \frac{Qd \cos \theta}{4\pi\epsilon r^2}$ using this obtain Electric field Intensity.	Understand, Remember	6
B) Calculate $\vec{E}$ at M (3,-4,2) in free space caused by a) a charge Q ₁ = 2μC at P ₁ (0,0,0) b) a charge Q ₂ = 3μC at P ₂ (-1,2,3) c) Both Q ₁ and Q ₂	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.3 Solve Any Two of the following.		12
A) State and Explain Amperes circuital law. And derive current continuity equation for time varying field.	Understand, Remember	6
B) Given the following values for P ₁ ,P ₂ ,I ₁ dl ₁ Calculate dH ₂ a) P ₁ (0,0,2) ,P ₂ (4,2,0) , $2\pi\vec{a}_z$ μAm b) P ₁ (0,2,0) ,P ₂ (4,2,0) , $2\pi\vec{a}_z$ μAm	Understand	6

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| C) In the region where $\sigma = 0, \epsilon r = 2.5, \mu r = 10$. Determine whether following pairs of field satisfy Maxwell's equation, $\vec{E} = 2y \vec{a}_y, \vec{H} = 5x \vec{a}_x$ | Understand,
Remember | 6 |
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Q.4 Solve Any Two of the following. **12**

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| A) Define: Propagation constant, characteristic impedance, reflection coefficient and VSWR | Understand | 6 |
| B) Describe various types of transmission line | Understand,
Remember | 6 |
| C) The Primary constants of a cable are
$R = 80 \Omega/\text{km}, L = 2 \text{ mH}/\text{km}, G = 0.3 \times 10^{-6} \Omega^{-1}/\text{km}, C = 0.07 \text{ mF}/\text{km}$
Calculate the characteristics constants of the line. | Understand | 6 |

Q.5 Solve Any Two of the following. **12**

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| A) A 15 GHz plane wave travelling in free space has amplitude of 20 V/m. Find Velocity of propagation, Wavelength, characteristic impedance of medium, amplitude of H, propagation constant. | Understand | 6 |
| B) Explain Linear, circular & Elliptical polarization in details. | Understand | 6 |
| C) For Poor conductor, prove that | Understand,
Remember | 6 |

$$\alpha = \frac{\sigma}{2} \sqrt{\frac{\mu}{\epsilon}} \quad \text{and} \quad \beta = \omega \sqrt{\epsilon \mu} \left[1 + \frac{1}{8} \left(\frac{\sigma}{\omega \epsilon} \right)^2 + \dots \right]$$

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