DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD -402 103
Semester Examination – May - 2019

Branch: Electronics and Telecommunication Engineering **Sem.:- II**

Subject with Subject Code:- Electromagnetics, Antenna and Prorogation (MTETE244E)

Marks: 60

Date: 20-10-2022 **Time:- 3 Hr.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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		(Marks)
Q.1 A)	Determine the divergence of these vector fields 1. $\mathbf{P} = x^2y\ \mathbf{a_x} + yz\ \mathbf{a_y} + z\ \mathbf{a_z}$ 2. $\mathbf{Q} = \rho\cos\o\ \mathbf{a_\rho} + \rho z\ \mathbf{a_\o} + z\sin\o\ \mathbf{a_z}$ 3. $\mathbf{R} = r^2\cos\theta\ \mathbf{a_r} + \cos\o\ \mathbf{a_\theta} + \sin\theta\ \mathbf{a_\o}$	(06)
B)	Given that $\mathbf{D} = 2\rho\cos^2\o\ \mathbf{a_z}$ C/m^2, Calculate the charge density at $(2, \pi/2, 3)$ and the total charge enclosed by the cylinder of radius 1 m with $-2 \leq z \leq 3$.	(06)
Q.2	Starting from Maxwell's equation, derive expressions for wave equation, propagation constant, attenuation constant, phase constant and intrinsic impedance for the wave propagating in lossy dielectric medium.	(12)
Q.3 A)	An infinitesimal electric dipole is centered at the origin and lies along z-axis. Find the far–field electric and magnetic fields radiated.	(06)
B)	Derive the expression for power radiated and find the radiation resistance of a half wave dipole	(06)
Q.4 A)	What are different feeding methods of rectangular patch antenna? Explain in detail with diagram.	(06)

B)	Design a rectangular patch antenna using a substrate (RT/duroid 5880) with dielectric constant of 2.2, h= 0.1588 cm so as to resonate at 12 GHz.	(06)
Q.5 A)	Explain log periodic dipole array in detail. Design a log periodic Dipole antenna to cover all the VHF TV channels (starting with 66 MHz for channel 4 and ending with 216 MHz for channel 13) The desired directivity is 8 dB and input impedance is 50 ohms. The element should be made of aluminum tubing with 19 cm outside diameter for largest element and feeder line and 0.48 cm for the smallest element. These diameter yield identical l/d ratio for smallest and largest element.	(12)
Q.6 A)	Derive an equation for fields radiated by a rectangular aperture mounted on an infinite ground plane.	(06)
B)	A rectangular aperture with a constant field distribution with a=3λ and b=2λ is mounted on an infinite ground plane. Compute FNBW, HPBW, FSLBW, FSLMM in E plane.	(06)