Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2015)

Fourth Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U15ECT404**:** Electromagnetic Fields

COURSE OUTCOMES

CO1: Describe basic concepts of static electric and magnetic fields.
CO2: Solve simple electrostatic and magneto static boundary problems.
CO3: Analyze the effect of static electric and magnetic fields under various configurations.
CO4: Describe Maxwell's equations for electromagnetic wave propagation.
CO5: Explain the concept of wave propagation in various mediums.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match the units of the following parameters. CO1 [K_1]

List I	List II
A. Free Space Permittivity	i. N
B. Force	ii. N/C
C. Electric Field Intensity	iii. F/m
D. Volume Charge	iv. C/m^3

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. The position vector of point P is the vector directed from _____ to point P. CO1 [K_1]

a) origin b) any point in free space
c) any point in z axis d) infinity

3. Relation between Torque and Moment is _____. CO2 [K_1]

a) m.B b) m X B
c) B X m d) –m.B

4. The unit of magnetic field intensity is _____. CO2 [K_1]

a) V/m b) A/m

c) C/m d) A/m^2

5. Assertion (A): Capacitance is the ratio of the magnitudes of the total charge on any one of the two conductors and potential difference between the conductors. COL [K_L]

Reason (R): Capacitance is not the function of charge, field intensity, flux density and potential difference.

a) Both A and R are Individually true and R is the correct explanation of A

b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

6. Inductance of a coaxial cable is _____. CO3 [K_1]

a) (a) ($\mu_0 d/2\pi$) ln(a/b) b) ($\mu_0 d/2\pi$) ln(b/a)

c) ($d/2\pi$) ln(b/a) d) ($\mu_0 2\pi/d$) ln(b/a)

7. The point form of Maxwell's second equation for the time varying field is derived from CO4 [K_1]

a) Coulomb's square law b) Gauss's law

c) Faraday's law d) Ampere's circuital law

8. $\nabla . B = 0$ is the point form of Maxwell's equation for CO4 [K_1]

a) static field b) dynamic field

c) time varying field d) magnetic field

9. Assertion (A): For a perfect dielectric, both the fields E and H are in phase. CO5 [K_1]

Reason (R): For a lossy dielectric, both the electric and magnetic fields are not in time phase.

a) Both A and R are Individually true and R is the correct explanation of A

b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

10. Depth of Attenuation constant of a good dielectric is_____. CO5 [K_1]

a) 0.25 b) 0.36

c) 0.47 d) 0.58

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Convert the point P(3,4,5) to Spherical coordinates. CO1 [K_1]

12. Relate Electric field intensity with force. CO1 [K_1]

13. Define Lorentz Force Equation and Torque. CO2 [K_1]

14.	Differentiate scalar and vector magnetic vector potential.	CO2	[K_2]
15.	Define Magnetization.	CO3	[K_1]
16.	If C1 = 100 mF and C2 = 50 mF, calculate the joint capacitance and total energy stored with the steady applied potential difference of 1000 V in each case.	CO3	[K_4]
17.	State Faraday's law for a moving charge in a constant magnetic field.	CO4	[K_1]
18.	Write the significance of displacement current density.	CO4	[K_1]
19.	Define skin effect and Brewster angle.	CO5	[K_1]
20.	List the properties of uniform plane wave.	CO5	[K_1]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Derive an expression for an electric field due to an infinite sheet of charge having uniform charge density ρ_s C/m^2, placed in xy plane cut a point P on z-axis at a distance of 'z' m from the origin.		CO1	[K_2]
22.	Using Biot-Savart law, develop the expression for magnetic field intensity at a point due to a infinite long straight filament carrying a steady current.		CO2	[K_3]
23.	i) Derive the Capacitance for a Parallel Plate Capacitor using Laplace Equations. ii) Derive the Continuity Equation for Current.	(10) (4)	CO3	[K_2]
24.	Derive Maxwell's equations in phasor form.		CO4	[K_2]
25.	Briefly explain about the wave incident obliquely to the surface of perfect conductor.		CO5	[K_2]
26.	Derive the expressions for energy stored, radiated power and complex Poynting vector.		CO4	[K_2]
27.	Explain how the nature of E and D behave at the boundary between conductor and free space with necessary derivation.		CO3	[K_2]

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