Register Number:……..

KUMARAGURU
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GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K_1 to K_6)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

B.E/B.TECH DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U14ECT302: Electromagnetic Fields

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Two Positive charges Q Coulomb each are placed at points (0,0,0) and (2,2,0),while two negative charges Q Coulomb each in magnitude are placed at points (0,2,0) and (2,0,0).The electric field at point (1,1,0) is CO1 [K_1]

   a) Zero
   b) $\frac{Q}{8\pi\varepsilon 0}$
   c) $\frac{Q}{4\pi\varepsilon 0}$
   d) $\frac{Q}{16\pi\varepsilon 0}$

2. The Coefficient of coupling between two coils depends on CO4 [K_4]

   1. Orientation of the coils
   2. Core material
   3. Number of turns on the two coils
   4. Self-inductance of the two coils

a) 1,2 and 3 are correct
b) 1 and 2 are correct
c) 3 and 4 are correct
d) 1,2 and 4 are correct

3. The Magnetic field at any point on the axis of a current carrying circular coil will be CO2 [K2]
a) Perpendicular to the axis
b) Parallel to the axis
c) At an angle of 45 degree with the axis
d) Zero

4. The Magnetic field intensity(in A/m) at the centre of a circular coil of diameter 1 m and carrying current of 2A is CO2 [K2]
a) 8
b) 4
c) 3
d) 2

5. A field F is said to be SOLENOIDAL if CO1 [K_1]
a) CURL F=0
b) DIV F=0
c) $\nabla^2 F=0$
d) $\oint F.dl = 0$

6. In a dielectric-conductor boundary, the tangential component of electric field is CO3 [K2]
a) E_i
b) $2E_i$
c) 0
d) Infinity

7. Skin depth is proportional to CO5 [K_2]
a) Frequency
b) permeability
c) $\sqrt{\sigma}$
d) $1/\sqrt{\sigma}$

8. Assertion (A): When a capacitor is charged to a certain potential, energy is stored in it. CO3 [K_2]
Reason (R): The storage takes place by a shift in the relative positions of the internal positive and negative charges against the normal molecular and atomic forces. Energy is stored in the electric field itself, in the dielectric.
a) Both A and R are correct
b) Both A and R are wrong
c) A is correct and R is Wrong
d) A is Wrong and R is correct

9. In a good conductor E/H ratio is CO5 [K1]
a) Real
b) Imaginary
c) Has a phase of 45 degree
d) Has no relevance,(i.e)E is independent of H

10. Match the following CO4 [K2]

List I	List II
A. Continuity equation	i. $\nabla x H = J + \partial D / \partial t$
B. Ampere's circuital law	ii. $J = \partial D / \partial t$
C. Displacement current density	iii. $\nabla \times E = - \partial B / \partial t$
D. Faraday's law	iv. $\nabla . J = - \partial P / \partial t$

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

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Define Guass divergence theorem. CO1 [K1]
12. Define dipole and dipole moment. CO1 [K2]
13. State Biot –Savart's law. CO2 [K2]
14. State Lorentz force equation. CO2 [K2]
15. State point form of ohms law. CO3 [K2]
16. A solenoid has an inductance of 20mH. If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance. CO3 [K4]
17. Given the conduction current density in a lossy dielectric as Jc= (0.02 $\sin 10^9 t$) A/m2. Find the displacement current density if $\sigma = 10^3$ mho/m and εr=6.5. CO4 [K6]
18. Define Poynting vector. CO4 [K_1]
19. Mention the properties of uniform plane wave. CO5 [K4]
20. Define skin effect. Mention its significance. CO5 [K2]

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

Q.No. 21 is Compulsory

21. Obtain the expressions for the Maxwell's equation in the point form and integral form. CO4 [K6]

22.	(i) Determine the electric field intensity of an infinitely long, straight line charge of a uniform density ρ_l in air.	(7)	CO1	[K5]
	(ii). State and prove Gauss's law.	(7)	CO1	[K1]
23.	(i) Find the magnetic flux density around infinitely long straight conductor using Bio-Savart law.	(7)	CO2	[K4]
	(ii) In cylindrical co-ordinates, $A=50r^2a_z$ wb/m is a vector magnetic potential in a certain region of free space. Find the H, B and J.	(7)	CO2	[K6]
24.	(i) Obtain the boundary conditions of normal and tangential components of magnetic field at the interface of two media with different dielectrics.	(7)	CO3	[K2]
	(ii) Solve the Laplace equation for the potential field in the homogenous region between the two concentric conducting spheres with radius a and b where b>a v=0 at r=b and V=Vo at r=a. Find the capacitance between the two concentric spheres.	(7)	CO3	[K3]
25.	(i) Derive maxwells equations in integral and differential forms.	(10)	CO4	[K1]
	(ii) Write the expressions for Instantaneous, average and complex poynting vector.	(4)	CO4	[K1]
26.	(i) Derive the expressions for the attenuation constant, phase constant and intrinsic impedance for a wave propagation in a good conductor.	(7)	CO5	[K4]
	(ii) Derive the transmission and reflection coefficient for the electromagnetic waves when incident normally on perfect dielectric.	(7)	CO5	[K4]

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