Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2024

ELECTRICAL AND ELCTRONICS ENGINERING

II Semester

EE5302 & ELECTROMAGNETIC THEORY

(Regulation2019)

Time:3hrs Max.Marks: 100

CO1	Computation, plotting and visual understanding of vectors and vector calculus
CO2	Ability to formulate the electromagnetic field problem to solve numerically
CO3	Ability to compute and analyze the electrostatic and magneto static field problem
CO4	Ability to formulate, solve and analyze EM problems for practical applications
CO5	Ability to measure the E/H fields

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)

(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	Show that **A** = 4 a_x -2 a_y –a_z and B= a_x+4a_y-4a_z are perpendicular to each other.	2	1	L2
2	Express the unit vector which points from z=h on the z axis toward (r,φ.0) in cylindrical coordinates.	2	1	L3
3	Sketch the equipotential plots for uniform and non- uniform field configurations	2	2	L2
4	Write Poisson's and Laplace's equations.	2	2	L1
5	State Ampere's Circuit Law	2	3	L1
6	A 3-cm-long solenoid carries a current of 400 mA. If the solenoid is to produce a magnetic flux density of 5 mWb/m , how many turns of wire are needed?	2	3	L2
7	Differentiate conduction and displacement current density	2	4	L3
8	State Faraday's law for magnetic circuit.	2	4	L1
9	Define intrinsic impedance.	2	5	L1
10	List out the properties of electromagnetic waves.	2	5	L1

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)(i)	Find the vector **A** directed from (2,-4,1)to(0,-2,0) in rectangular coordinates and find the unit vector along **A.**	3	1	L4
(ii)	State and derive Divergence theorem. Mention the significance of the same.	10	1	L2
	OR			
11 (b)	Briefly discuss the different sources of EMF	3	1	L2
	Derive an expression for electric field intensity due to a infinite line charge	10	1	L4
12 (a) (i)	Explain the need of having uniform field distribution in a electrical system	5	2	L1
(ii)	Draw and discuss the E,V and charge distribution pattern in and around a uniformly charged sphere	8	2	L1

(ii)	Derive the expression for capacitance in the static electric field	8	2	L3
13 (a) (i)	State and explain Biot-Savart's law	5	3	L1
(ii)	Explain, H inside and outside a circular conductor of uniform current density and repeat the same for a coaxial cable	8	3	L1
	OR			
13 (b)(i)	Evaluate Inductance for air-core long Solenoid	5	3	L5
(ii)	Derive the boundary conditions for magnetic field in multiple media	8	3	L5
14 (a)	Explain the working principle of Faraday's homopolar generator and derive Transformer and motional EMF of magnetic circuit.	13	4	L4
	OR			
14 (b)	From the basic laws, derive all the Maxwell's equations both in differential and integral form.	13	4	L4
15 (a)	Explain, EM wave motion in the following media (i) free space (ii) Lossless dielectrics (iii) Lossy dielectric (iv) Good conductors.	13	5	L1
	OR			
15 (b)	State and explain Poynting vector and enlist the applications tanding Wave	13	5	L1

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.(i)	Derive the boundary conditions for electric field in multiple media	10	2	L1
(ii)	A medium has the following parameters μ_r=10, ε_r=2.5, $\delta=10^{-4}$ Mho/meter, Determine α, β, λ ,v and η for 1GHz.	5	5	L5