Roll No											

PRESIDENCY UNIVERSITY
BENGALURU

SET B

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2024

Semester : Semester III - 2022
Course Code : EEE2003
Course Name : Electromagnetic Fields
Program : B.Tech.

Date : 05-JAN-2024
Time : 9:30AM - 12:30 PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.
(iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS **5 X 4M = 20M**

1. Application of scalar and vector products are countless especially in situations where there are two forces acting on a body in a different direction. List the differences between scalr product and vector product.
(CO1) [Knowledge]

2. Electrostatics is a fascinating subject that has grown up in diverse areas of application. Electric power transmission, X-ray machines, and lightning protection are associated with strong electric fields and will require a knowledge of elecctrostatics to understand and design suitable equipment. state the following laws with necessary equations.
a. Coulombs's Law b. Gauss's Law
(CO2) [Knowledge]

3. A magnetostatic field is produced by a constant current flow (or direct current). This current flow may be due to magnetization currents as in permanent magnets, electron-beam currents as in vacuum tubes, or conduction currents as in current-carrying wires. State Biot savart's law with necessary eqation.
(CO3) [Knowledge]

4. Write the analogy between Electric and Magnetic Field.
(CO3) [Knowledge]

5. Define the following fields.
a. Divergence of a vector b. curl of a vector c. Divergence theorem d. Stokes theorem
(CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS **5 X 10M = 50M**

6. Coaxial cable has an inner and outer core that share a geometric axis. This prevents electromagnetic interference and enables more reliable data transmission over longer distances. An underground coaxial cable is used for transmitting electrical power from one place to another. The inner radius is 6 cm and outer radius is 15 cm. If the cable is impressed with the voltage of 5.2 kV and the relative permittivity of the cable is 2, then
a) Identify the unknown quantities that could be computed from the given data
b) Compute the unknown Quantities.
(CO2) [Comprehension]

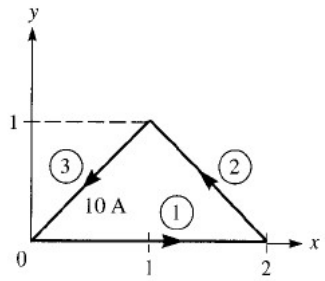
7. The flux due to the electric field E can be calculated using the general definition of flux in electric field. For practical reasons, however, this quantity is not usually considered as the most useful flux in electrostatics. The vector field D is called the electric flux density and is measured in coulombs per square meter. Given that D = z r cos^2 (Ø) **az** C/m2, calculate the charge density at (1, Π/4, 3) in C/m

(CO2) [Comprehension]

8. A General law of magneto statics states that the magnetic field intensity dH produced at a point P in space by a differential current clement is proportional to the product differential current element and the sine of the angle a between the element and the line joining P to the element and is inversely proportional to the square of the distance between P and the element. A thin ring of radius 5 cm is placed on plane z = 2 cm so that its center is at (0, 0, 2 cm). If the ring carries 100 mA along aø, find H at (a) (0, 0, - l c m) (b) (0, 0, 10 cm).

(CO3) [Comprehension]

9. The conducting triangular loop in figure carries a current of 10A. Find H at (0,0,5) due to side 1 of the loop.



(CO3) [Comprehension]

10. According to Faraday's experiments, a static magnetic field produces no current flow, but a time-varying field produces an induced voltage (called electromotive force or simply emf) in a closed circuit, which causes a flow of current. Faraday discovered that the induced emf (in volts), in any closed circuit is equal to the time rate of change of the magnetic flux linkage by the circuit. Explain the three different methods by which variation in flux is realized with necessary equations.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS **2 X 15M = 30M**

11. The xy-plane serves as the interface between two different media. Medium 1 (z < 0) is filled with a material whose μr = 6, and medium 2 (z > 0) is filled with a material whose μr = 4. If the interface carries current (1/μo) **ay** mA/m, and B2 = 5**ax**, + 8**az** mWb/m2.

i. List the quantities that are associated with magnetic fields can be found with the given data.

ii. Compute the listed quantities.

(CO3) [Application]

12. A uniform plane wave propagating in a medium has E = 50 sin (10 t + 2z) ay V/m. If the medium is characterized by conductivity(σ) = 4 S/m, εr = 1, μr = 20.

(a) List the quantities which are associated with EM waves can be found out by using the above data.

(b) Compute the listed quantities.

(CO4) [Application]