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**Question Paper Code: 43303**

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Third Semester

Electrical and Electronics Engineering

14UEE303 – FIELD THEORY

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The Curl of a vector is
  - dot product
  - cross product
  - one
  - zero
- In cylindrical coordinate system  $\phi$  varies from
  - 0 to  $90^\circ$
  - 0 to  $180^\circ$
  - 0 to  $270^\circ$
  - 0 to  $360^\circ$
- The flux density at a point in space is given by  $B=4xa_x+2Kya_y+8a_z$  wb/m<sup>2</sup>. Find the value of constant k must be equal to
  - 2
  - 0.5
  - +0.5
  - +2
- $\epsilon_0$  is
  - $8.854 \times 10^{-12}$  F/M
  - $6.854 \times 10^{-12}$  F/M
  - $6.854 \times 10^{-12}$  H/M
  - $8.854 \times 10^{-12}$  F/M
- The number of magnetic flux crossing unit area perpendicularly is called
  - Magnetic intensity
  - Magnetic flux density
  - Magnetic Force
  - Magnetic field lines

6. Given a vector field  $F=y^2x\mathbf{a}_x-yz\mathbf{a}_y=x^2\mathbf{a}_z$ , the line integral  $F \cdot d\mathbf{l}$  evaluated along a segment on the X-axis from  $x=1$  to  $x=2$  is
- (a) -2.33                      (b) 0                      (c) 2.33                      (d) 7
7. Magnetic material which has iron as one of its constituents is known as
- (a) Ferro magnetic material                      (b) Diamagnetic material  
(c) Paramagnetic material                      (d) Conducting magnetic material
8. Reluctance of magnetic circuit
- (a)  $\frac{A}{l\mu}$                       (b)  $\frac{l}{A\mu}$                       (c)  $\frac{l}{\mu}$                       (d)  $\frac{A}{\mu}$
9. Electromagnetic waves can travel through space, they do not need this to travel through
- (a) electric energy                      (b) charge                      (c) medium                      (d) magnetic field
10. The value of standing wave ratio lies between
- (a) 1 and  $\infty$                       (b) 0 and  $\infty$                       (c)  $-\infty$  and  $+\infty$                       (d) -1 and +1

PART - B (5 x 2 = 10 Marks)

11. Define Curl.
12. Express the Poisson's and Laplace equation.
13. Define Lorentz law of force.
14. Write down the integral and point form of Maxwell's equation using Faraday's law.
15. Define wave propagation.

PART - C (5 x 16 = 80 Marks)

16. (a) Explain briefly the spherical and cylindrical coordinate systems. (16)

Or

- (b) State and prove
- (i) Divergence theorem (8)
- (ii) Stokes theorem (8)
17. (a) (i) Develop an expression for  $E$  and  $D$  due to the infinity sheet of charge placed in  $Z = 0$  plane, using Gauss's Law. (8)

- (ii) Develop an expression for electric field intensity due to an uniformly charged infinite long straight line with constant charge density in  $c/m$ . (8)

Or

- (b) Explain the capacitance of a parallel plate capacitor and calculate the equivalent capacitance value using the following details.

$$\text{Plate area } A = 100 \text{ cm}^2$$

$$\text{Dielectric-1 } \epsilon_{r1} = 4, \quad d_1 = 2 \text{ mm}$$

$$\text{Dielectric-2 } \epsilon_{r2} = 3, \quad d_2 = 3 \text{ mm}$$

If  $200V$  is applied across the plates, what will be the voltage, gradient across each dielectric? (16)

18. (a) State and explain Ampere's circuit law and show that the field strength at the end of a long solenoid is one half of that at the centre. (16)

Or

- (b) Derive the energy stored and hence energy density in a magnetic field. (16)

19. (a) State and derive the Maxwell's equations for free space in integral form and point form for time varying field. (16)

Or

- (b) Derive the Maxwell's equation and obtain them in point and integral form. (16)

20. (a) Derive wave equations for a conducting medium. (16)

Or

- (b) (i) What is the different conditions of uniform plane wave? (8)

- (ii) Derive a physical phenomenon of electro-magnetic wave equation. (8)

