**Reg. No. :** | | | | | | | | | | |

## Question Paper Code: 43303

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

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)

1. The cylindrical system coordinates are represented in terms of

   (a) $(x, y, z)$ (b) $(\rho, \varphi, z)$ (c) $(r, \theta, \varphi)$ (d) all the above

2. A dielectric slab with 500mm X 500mm cross-section is 0.4m long. The slab is subjected to a uniform electric field of $E=6a_y+8a_y$ kv/mm. The relative permittivity of the dielectric materials is equal to 2.The value of constant $\varepsilon_0$ is $8.85X10^{-12}$F/m. What is the energy stored in the dielectric?

   (a) $8.85X10^{-12}$F/m (b) $8.85X10^{-5}$ (c) 8.85 (d) None of these

3. The flux density at a point in space is given by $B=4xa_x+2Kya_y+8a_z$ wb/$m^2$.Find the value of constant k must be equal to

   (a) -2 (b) -0.5 (c) +0.5 (d) +2

4. The direction of vector A is radially outward from origin, with $A=kr^n$ where $r^2=X^2+Y^2+Z^2$ and K is constant. The value of n for which $\Delta.A = 0$ is

   (a) -2 (b) 2 (c) 1 (d) 0

5. Which of the following is the unit of magnetic flux density

(a) Weber (b) Lumens (c) Tesla (d) None of these

6. Given a vector field $F=y^2xa_x-yza_y=x^2 a_z$, the line integral F.dl 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. Substance which have the permeability less than the permeability of free space are known as

(a) ferromagnetic (b) paramagnetic (c) diamagnetic (d) bipolar

8. Field due to infinitely long line charge along Z-axis varies with

(a) $\rho$ (b) $\Phi$ (c) Z (d) None of these

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. Write the conditions of vector A to be Solenoidal and irrotational.

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. State Poynting theorem.

PART - C (5 x 16 = 80 Marks)

16. (a) Derive the expression interms of Cartesian, cylindrical and spherical co-ordinate 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) State and derive electric boundary condition for a dielectric to dielectric medium and a conductor to dielectric medium. (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) Obtain the expression for energy stored in the magnetic field and also derive the expression for magnetic energy density. (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 in phasor integral form. (16)

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

Or

(b) (i) State Poynting theorem and derive an expression for Poynting vector. (8)

(ii) A certain transmission line, working at radio frequencies, has following constants, $L = 9\ \mu H/m$, $C = 16\ pF/m$. The line is terminated in a resistive load of 1000 $\Omega$. Find the reflection coefficient and standing wave ratio. (8)

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