Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 8007

B.E. / B.Tech. DEGREE SUPPLEMENTARY EXAMINATIONS – FEB. / MAR.2020
Third Semester
Electrical and Electronics Engineering
U15EE302 – ELECTROMAGNETIC FIELD
(Regulation 2015)

Time : Three Hours Maximum : 100 Marks

Answer ALL the questions

PART – A

(10 x 2 = 20 Marks)

1. What is physical significance of divergence of D.
2. State Stoke's theorem.
3. State Gauss law for electric fields.
4. Give the relationship between potential gradient and electric field.
5. State Biot –Savarts law.
6. State Ampere circuital law.
7. Define self inductance.
8. Distinguish between solenoid and toroid.
9. State Poynting Theorem.
10. Mention the properties of uniform plane wave.

PART – B

(5 x 13 = 65 Marks)

11. a) i. Transform the given vector $A = 4a_x - 2a_y + 3a_z$ at $P(x = +2, y = +3, z = 4)$ to spherical coordinates. Also prove Divergence and Stoke's Theorem. (6)

ii. Verify the divergence theorem for the following case $A = xy^2a_x + y^3a_y + y^2za_z$ and the surface is the cuboid defined by $0 < x < 1, 0 < y < 1, 0 < z < 1$. (7)

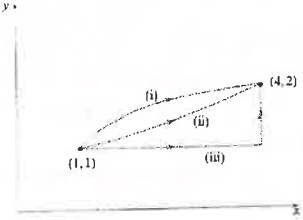
(OR)

b) Evaluate the line integral $I=\int_c a.dr$, where $a = (x + y)i + (y - x)j$, along each of thepaths inthe *xy*-plane shown in the figure 1 below, namely,

i. The parabola $y^2 = x$ from (1, 1) to (4, 2), (4)

ii. The curve $x = 2u^2 + u + 1$, $y = 1 + u^2$ from (1, 1) to (4, 2) (4)

iii. The line y = 1 from (1, 1) to (4, 1), followed by the line y = x from (4, 1) to (4, 2). (5)



12. a) Evaluate both sides of the divergence theorem for the field $D = (2xy a_x + x^2 a_y)$ C/m^2 and the rectangular parallelepiped formed by the planes x = 0 and 1, y = 0 and 2 and z = 0 and 3.

(OR)

b) State gauss law for the electric and magnetic fields. Derive its integral and differential forms. Make at least two conclusions. And also write a short note on Coulomb's Law.

13. a) Illustrate Biot-Savart Law and derive the calculation of magnetic field for simple coil configurations and state ampere's Law.

(OR)

b) A air core toroid has a mean radius of 40mm and is wound with 4000 turns of wire. The circular cross- section of the toroid has a radius of 4mm. A current of 10 A is passed in the wire. Find the inductance and the energy stored.

14. a) An air coaxial transmission line has a solid inner conductor of radius 'a' and a very thin outer conductor of inner radius 'b'. Determine the inductance per unit length of the line.

(OR)

b) An inductor of 3 henries and resistance 6ohms is connected to the terminals of a battery of emf, 12volts and of negligible internal resistance. Calculate

i. The initial rate of increase of current in the circuit,

ii. The rate of increase of current at the instant when the current in the circuit is 1ampere.

15. a) State Poynting's theorem and relevant factors with proof and explain its physical significance.

(OR)

b) Evaluate the wave equation in 1-Dimension and find the solution of the wave equation and mention the expression for the total current density.

PART – C

(1 x 15 = 15 Marks)

16. a) Write down Maxwell's Equations in their general point form. Derive the corresponding equations for fields varying harmonically with time.

(OR)

b) Derive the 1-dimensional (1-D) Wave equations with suitable examples. Find the skin depth at a frequency of 2 MHz in Aluminum where $\sigma = 38.2$ M s/m and $\mu_r = 1$.