

Enrolment No:

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LDRP INSTITUTE OF TECHNOLOGY AND RESEARCH, GANDHINAGAR
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
B.E. 5th SEMESTER
MID SEMESTER EXAMINATION AUGUST-2014

Subject Code: EC 503

Branch: EC

Subject Name : ELECTROMAGNETIC THEORY

Total Marks: 30

Date : 26/08/2014

Time: 08.30 AM to 10.00 AM

Instructions: - All questions are compulsory.
- Figures to the right indicate full marks.
- Make suitable assumption, wherever necessary.

Que. 1 Answer the followings (06)

- A) Mention the properties of perfect conductor.
- B) State the experimental law of coulomb.
- C) State the Gauss's law.

Que. 2 Answer the following questions. (12)

- A) List the applications of Gauss's law. Explain any one.
- B) The Cylindrical surface $\rho=8\text{cm}$ contains the surface charge density $\rho_s=5e^{-20|\rho|}\text{ nC/m}^2$. (a) What is the total amount of charge present? (b) How much electric flux leaves the surface $\rho=8\text{cm}$, $1\text{cm}<z<5\text{cm}$, $30^\circ<\phi<90^\circ$?
- C) An electric field is given as $\mathbf{E}=-10e^y(\sin 2z \mathbf{a}_x + x \sin 2z \mathbf{a}_y + 2x \cos 2z \mathbf{a}_z) \text{ V/m}$. (a) Find \mathbf{E} at $P(5,0,\pi/12)$. (b) How much work is done in moving a charge of 2 nC an incremental distance of 1mm from P in the direction of \mathbf{a}_x ? (c) of \mathbf{a}_y ? (d) of \mathbf{a}_z ? (e) of $(\mathbf{a}_x+\mathbf{a}_y+\mathbf{a}_z)$?

OR

- A) Derive the electric field at a point due to line charge.
- B) List divergence of vector in rectangular, cylindrical and spherical coordinates.
- C) The sun radiates the total power of about 2×10^{26} watts(W). If we imagine the sun's surface to be marked off in latitude and longitude and assume uniform radiation, (a) What power is radiated by the region lying between latitude 50° N and 60° N and longitude 12° W and 27° W ? (b) What is the power density on the spherical surface 93,000,000 miles from the sun in W/m^2 ?

Que. 3 Answer the following questions. (12)

- A) Derive the point form of the continuity equation.
- B) Explain and derive the equation for Biot Savart's law. states it's significant
- C) Let $\mathbf{J} = 400 \sin \Theta / (r^2 + 4) \mathbf{a}_r \text{ A/m}^2$. (a) Find the total current flowing through that portion of the spherical surface $r=0.8$, bounded by $0.1\pi < \Theta < 0.3\pi$, $0 < \phi < 2\pi$. (b) Find the average value of \mathbf{J} over the defined area.

OR

- A) Explain the boundary condition for conductor.
- B) Derive and state the Ampere's circuital law.
- C) The charge density varies with radius in cylindrical coordinate system as $\rho_v = \rho_0 / (\rho^2 + a^2)^2 \text{ C/m}^3$. Within what distance from the Z axis does half the total charge lie?

***** All The Best *****