GOVERNMENT COLLEGE OF ENGINEERING, JALGAON
(An Autonomous Institute of Government of Maharashtra)
National Highway No.6, JALGAON – 425 002

Phone No.: 0257-2281522   Fax No.: 0257-2281319
Website : www.gcoej.ac.in   E-mail : princoej@redifmail.com

Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **ET351U - Electromagnetics and Fields**

Generated At : **19-04-2022 14:57:45**

Maximum Marks : **60**   Duration : **3 Hrs**

Edit   Print   View Answer Key   Close   **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. **Solve any Four questions.**
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1) a) Define electric field intensity $\overline{E}$. Derive the expression for the same using Coulomb's law of force. [6]

b) Find the current crossing the portion of $y = 0$ plane defined by $-0.1 < x < 0.1\ m$ and $-0.002 < z < 0.002m$ if $\overline{J} = 10^2\ x\ \overline{a}_y$ where $\overline{J}$ is the current density. [4]

c) What is Waveguide? What are the types of waveguide? [5]

2) a) State and derive Biot – Savart's law. [7]

b) In a certain region , the electric field is given by- $\overline{D} = 2\rho\left(z+1\right)cos\phi\widehat{a_\rho} - \rho\left(z+1\right)sin\ \phi\ \widehat{a_\phi} + \rho cos\phi\widehat{a_z}\ \mu C/m^2$ [8]

1. Find charge density
2. Calculate the total charge enclosed by the volume $0 < \rho < 2, 0 < \phi < \pi/2, 0 < z < 4$

3) a) Point charges $1\ mC$ and $-2\ mC$ are located at $(3,\ 2,\ -1)$ and $(-1,\ -1,\ 4)$, respectively. Calculate the electric force on a $10nC$ charge located at $(0,\ 3,\ 1)$ and the electric field intensity at that point. [6]

b) In cylindrical co-ordinates $\overline{B} = \frac{2.0}{r}\widehat{a_\phi}$ tesla. Determine the magnetic flux ϕ crossing the plane surface defined by $0.5 < r < 2.5m$ and $0 \leq z \leq 2m$ [4]

c) Derive the relation between electric field intensity E and electric potential V [5]

4) a) The finite sheet $0 < x < 1, 0 < y < 1$ on the $z = 0$ plane has a charge density $\rho_s = xy(x^2 + y^2 + 25)^{3/2}\ nC/m^2$ Find [7]

1. The total charge on the sheet
2. The electric field at $(0,\ 0,\ 5)$
3. The force experienced by a $-1mC$ charge located at $(0,\ 0,\ 5)$

b) What are the advantages and disadvantages of Yagi uda antenna? [4]

c) State and prove Lorentz Reciprocity Theorem for antennas. [4]

5) a) Write Maxwell's equation for static field in both differential and integral forms. [8]

b) Define the following terms regarding antennas: [7]

1. Radiation resistance
2. Radiation pattern
3. Directivity
4. Antenna efficiency

Auto Generated by SsOES v6.2