Solution	Marks
Q.2 a. Find the expression for Electric field due to Infinite sheet line charge Distribution using Coulomb's Law.	**8**
Answer: Text Book 1, page no 44, 45	08
b. **State Gauss's law; represent Gauss's law in Differential and Integral form. What are the limitations of Gauss Law?**	**8**
Answer: Text book 1, page no 60,61	08
Q.3 a. Derive an expression for Energy Density in Electrostatics.	**8**
Answer: Text book 1, page no 111	08
b. Show that "Tangential Electric field component is zero and normal component of flux density is equal to surface charge density in conductor – dielectric boundary".	**8**
Answer: Text book 1, page no 144	08
Q.4 a. Show that the capacitance varies inversely as the square root of the voltage.	**7**
Answer: JUNE 2013	
b. Given the potential field $V = 2x^2y - 5z$ **and a point P (-4, 3, 6). Find several numerical values at point P, the potential V, the electric field intensity E, the direction of E, the electric flux density D, and the volume charge density** ρ_v**.**	**9**
Answer: Text book 1, page no 100-101/Example 4.3	
Q.5 a. Derive an expression for magnetic flux density at a point P due to a long straight conductor carrying current I using vector magnetic potential.	**8**
Answer: Text book 1, page no 228,229	08
b. The magnetic field intensity is given in certain region of free space is $H = \frac{x+2y}{z^2}y + \frac{2}{z}z$ **A/. Determine the total current passing through the surface z = 4, 1< x< 2 and 3 < y< 5 in z direction.**	**8**
Answer: $\nabla \times \mathbf{H} = \frac{1}{r\sin\theta}\frac{\partial}{\partial\theta}(54r\cos\theta\sin\theta))\,\mathbf{a}_r - \frac{1}{r}\frac{\partial}{\partial r}\left(54r^2\cos\theta\right)\mathbf{a}_\theta + \frac{1}{r}\frac{\partial}{\partial r}\left(\frac{3r^3}{\sin\theta}\right)\mathbf{a}_\phi = \mathbf{J}$ Thus $\mathbf{J} = 54\cot\theta\,\mathbf{a}_r - 108\cos\theta\,\mathbf{a}_\theta + \frac{9r}{\sin\theta}\mathbf{a}_\phi$ $\int_S (\nabla\times\mathbf{H})\cdot d\mathbf{S} = \int_0^{2\pi}\int_0^5 \left[54\cot\theta\,\mathbf{a}_r - 108\cos\theta\,\mathbf{a}_\theta + \frac{9r}{\sin\theta}\mathbf{a}_\phi\right]_{\theta=20^\circ}\cdot \mathbf{a}_\theta\, r\sin(20^\circ)\,dr\,d\phi = -\int_0^{2\pi}\int_0^5 108\cos(20^\circ)\sin(20^\circ)r\,dr\,d\phi = -2\pi(54)(25)\cos(20^\circ)\sin(20^\circ) = \underline{-2.73\times10^3\text{ A}}$	08

Q.6 a. Show that $(curlH)_N = \lim_{\Delta S_N \to 0} \frac{\oint H.dh}{\Delta S_N}$ **8**

Answer: Text book 1, page no 226-227/Equation 21 08

b. Show that Normal component of Magnetic flux is continuous and tangential component of Magnetic field is continuous for two magnetic media μ_1 and μ_2. **8**

Answer: Text book 1, page no 297 08

Q.7 a. State Faraday's law of electromagnetic induction. Show how it leads to the Maxwell equation $\nabla \text{x} E = -\frac{\partial B}{\partial t}$ **8**

08

Answer: Text book 1, page no 323

b. If E is electric field, V is scalar potential and A is vector magneticpotential then show that for time varying fields **8**

$$\mathbf{E} = -\nabla \text{V} - \frac{\partial \mathbf{A}}{\partial \text{t}}$$

Text book 1, page no 338 08

Answer:

Q.8 a. Explain the effects of ionosphere on rays of varying incidence. **8** 08

Answer: Text book 2, page no 242-243

b. Give synthesis of resonant antenna radiation pattern. **8** 08

Answer: Text book 2, page no 261-262

Q.9 a. With help of spherical coordinate system, explain the following antenna **8**

Parameters:

(i) Radiation Pattern **(ii) Pattern lobes**

(iii) Directivity **(iv) Total efficiency**

Answer: Each definitions each 2M

b. Write short note on:

(i) UHF and microwave Antennas (ii) Nonresonant Antennas **8** 08

Answer: Text book 2, page no 280-284/Aritical 9.7& 9.6.3

TEXT BOOK

Engineering Electromagnetics, W. H. Hayt and J. A. Buck, Seventh Edition, Tata McGraw Hill, Special Indian Edition 2006

Electronic Communication Systems, George Kennedy and Bernard Davis, Fourth Edition (1999), Tata McGraw Hill Publishing Company Ltd

Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, 6th Edition, Pearson Education Low Price Edition