

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER • 2014****Subject Code: 151002****Date: 03-12-2014****Subject Name: Engineering Electromagnetic****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. EM is Electro-Magnetic

- Q.1 (a)** Find out unit vector i_n perpendicular in the right-hand sense to the vectors $A = -i_x + i_y + i_z$, $B = i_x - i_y + i_z$? Draw A, B and i_n . What is the angle between A and B? **07**
- (b)** What is the principle of superposition of charges? Explain it in context with static electric forces and electric field intensity with necessary equations. **07**
- Q.2 (a)** Explain Gauss's law with its application's examples and divergence theorem. **07**
- (b)** Find out of work required to move the charge from point A to point B in static electric field. **07**
- OR**
- (b)** Faraday's electric charge experiment is repeated with the following sequence of steps: (i) A ball with total charge Q is brought inside an insulated metal ice-pail without touching. (ii) The outside of the pail is momentarily connected to the ground and then disconnected so that once again the pail is insulated. (iii) Without touching the pail, the charged ball is removed. (a) Sketch the charge distribution on the inside and outside of the pail during each step. (b) What is the net charge on the pail after the charged ball is removed? **07**
- Q.3 (a)** What do you mean by polarization? Find out for dipole Electric field intensity at distance $r \gg d$ -separation between charges. **07**
- (b)** Derive an equation of energy stored in capacitor and also find out capacitance of an isolated sphere. **07**
- OR**
- Q.3 (a)** Discuss in detail potentials and Laplace equation and uniqueness theorem in context with it. **07**
- (b)** For a surface between dissimilar materials what is the tangential component of electric field and what is the normal component of electric flux density. **07**
- Q.4 (a)** What is the difference between Bio-Savart's law and ampere's law, define curl find its equation for magnetic field? What is the correction suggested by Maxwell in ampere's law for completion of mathematical description of EM wave Theory. **07**
- (b)** Define and derive an equation for vector magnetic potential also derive an equation of force on moving charge under effect of EM field **07**
- OR**
- Q.4 (a)** For a surface between dissimilar materials what is the tangential component of magnetic field intensity and what is the normal component of magnetic flux density. **07**
- (b)** Prove that Energy stored in Inductor of the loop, isolated and is within a linear permeable material is $\frac{1}{2} Li^2$. Also find out an inductance of an N-turn coil. **07**

- Q.5 (a)** Explain Faraday's law of EM induction, Comment on direction of induced e. m. f. also using stoke's theorem find out point form of Maxwell's equation related to EM induction. **07**
- (b)** Write short note on plane (TEM) wave in context with wave equation and its solution. **07**
- OR**
- Q.5 (a)** Given power density $P=200 \text{ Watt/m}^2$ at 2GHz find out permissible Electric and magnetic field. **07**
- (b)** State and prove pointing vector theorem of EM field. **07**
