B. TECH.

FOURTH SEMESTER EXAMINATION, 2001-2002

ELECTROMAGNETIC FIELD THEORY

Time : Three Hours *Total Marks : 100*

Note : (1) Attempt ALL questions.
(2) All questions carry equal marks.

1. Attempt any FOUR of the following :— (5 × 4)

(*a*) State and prove Gauss's Law and discuss its application.

(*b*) Discuss the difference between dot product and cross product.

(*c*) What do you mean by divergence of a vector field ? Justify your statement analytically and give its physical interpretation.

(*d*) What do you mean by Curl of a vector field ? Substantiate it analytically and state the physical interpretation.

(*e*) What is Stokes Theorem ? State and prove it.

(*f*) Discuss the vector representation of a surface.

2. Attempt any TWO of the following :— (10 × 2)

(*a*) Express Poisson's and Laplace's equations in various co-ordinate systems.

(*b*) State whether following potential functions satisfy Laplace's equation :—

(*i*) $V = Cxyz$

(*ii*) $V = Cr\phi z$

(*iii*) $V = Cr\theta\phi$

(*c*) Determine the capacitance to neutral per m of a single phase line taking into account the effect of the ground. The charge on the line is $+Q$, h is the height of the line above ground and r is the radius of the conductor.

3. Explain any TWO of the following :— (10 × 2)

(*a*) Amperes' law of force and its application

(*b*) Faraday's law and its application

(*c*) Energy stored in magnetic fields

4. Attempt any TWO of the following :— (10 × 2)

(*a*) The Poynting Theorem gives the energy balance in a system. Justify it by obtaining necessary relation.

(*b*) The average Poynting vector is given by

$$P_{av} = \frac{1}{2}\eta E^2$$

Justify it.

(*c*) VSWR and reflection indicate the matching condition between two networks. Justify it.

5. Explain any TWO of the following :— (10 × 2)

(*a*) Application of Smith's chart in matching

(*b*) Transmission line equation and its characteristic impedance

(*c*) Various distortions in lines