

**B.Tech. - VIEP - ELECTRICAL ENGINEERING
(BTELVI)**

Term-End Examination

00645

June, 2019

BIEE-009 : APPLIED ELECTROMAGNETICS

Time : 3 hours

Maximum Marks : 70

Note : Answer any seven questions. Each question carries equal marks. Use of scientific calculator is allowed. Suitably assume any missing data.

- 1, Given point $P_1 = (3, -4, 3)$ and vector $A = \hat{x}2 - \hat{y}3 + \hat{z}4$, defined in Cartesian coordinates, express P_1 and A in cylindrical coordinates and evaluate A at P_1 . 10

- 2, Two point charges of 1 C each and of the same sign are placed 1 mm apart in air. What is the magnitude of the repulsive force? 10

- 3, Show that Gauss' law depends on the inverse square law, that is, $E \propto \frac{1}{r^2}$ for a point charge. 10

4. Show that the total capacitance of n unequal capacitors is more than the capacitance of the largest when they are connected in parallel and less than the capacitance of the smallest when they are connected in series. 10

5. State and explain Biot-Savart law for the magnetic field of a current carrying element. Derive the expression of magnetic field B produced by current carrying element Δl as a function of radius r , angle θ , current I and length Δl . 10

6. Calculate the inductance of a solenoid of 2000 turns wound uniformly over a length of 500 mm of a cylindrical tube 40 mm in diameter. The medium is air ($\mu = \mu_0$). 10

7. A 1 MHz (300 m wavelength) plane wave travelling in a normally dispersive, lossless medium has a phase velocity at this frequency of 300 $\mu\text{m}/\text{sec}$. The phase velocity v as a function of wavelength is given by

$$v = k\sqrt{\lambda}$$

where k is a constant.

Find the group velocity. 10

8. Write short notes on any *two* of the following : $2 \times 5 = 10$

- (a) Wave Equation of Transmission Line
 - (b) Poisson's Equation in Electrostatics
 - (c) Stokes' Theorem
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