SEMESTER II (B.TECH.)

ACADEMIC YEAR: 2021-22

JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY GUNA
Test-III (Even Semester 2022)
18B11PH211 PHYSICS-II

MAXIMUM DURATION: 2 HOURS

MAXIMUM MARKS: 35

IMPORTANT: Do not write any thing on the question paper except the Enrollment Number. All seven questions are compulsory. The total marks for each question have been indicated next to it.

In free space $B = \mu_0 H$ and $\mu_0 = 4\pi \times 10^{-7}\,\text{N/A}^2$

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1. Calculate Curl of the following vector function: [5]

$$\mathbf{F} = (r\cos^2\theta)\hat{r} - (r\cos\theta\sin\theta)\hat{\theta} + 3r\hat{\phi}$$

2. Two plates of a parallel-plate capacitor are kept at a distance d and are maintained at $V = 0$ Volt at $x = 0$ and $V = V_0$ at $x = d$. Solve a suitable Laplace's equation to determine potential and electric field between the plates of the capacitor. [5]

3. An infinitely long, straight conductor of radius a has a magnetic field $\mathbf{B} = \hat{\phi}(\mu_0 I s / 2\pi a^2)$ within the conductor ($s < a$) and $\mathbf{B} = \hat{\phi}(\mu_0 I / 2\pi s)$ outside the conductor ($s > a$). Calculate current density J in both regions. [5]

4. Use Biot-Savart's law to calculate magnetic field a distance s from a long straight wire carrying a steady current I. [Draw the Figure] [5]

5. For the magnetic field $\mathbf{B} = (2/s)\hat{\phi}$ T. Determine the magnetic flux Φ_B crossing the plane surface defined by $0.5 \leq s \leq 2.5\,\text{m}, 0.0 \leq z \leq 2.0\,\text{m}$. [5]

6. Write down Maxwell's equations and obtain corresponding wave equations for electric field E and magnetic field B. [5]

7. Discuss the inconsistency of Ampère's law and using necessary mathematical treatment discuss the correction suggested by Maxwell. [5]