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B.Tech. DEGREE EXAMINATION, NOVEMBER 2019
Third Semester

**EC0201 – ELECTROMAGNETIC THEORY AND
WAVEGUIDES**

(For the candidates admitted from the academic year 2007-2008 to 2012-2013)

Time: Three hours

Max. Marks: 100

Answer **ALL** Questions

PART – A (10 × 2 = 20 Marks)

1. Define Curl of a vector.
2. Find the gradient of $V = e^{-z} \sin 2x \cosh y$.
3. State Biot-Savart law.
4. Distinguish magnetic scalar and magnetic vector potential.
5. What is Lenz law?
6. Express the equation for current continuity.
7. What is dominant mode?
8. What are guided waves? Give examples.
9. Why TEM wave is not possible in a rectangular wave guide?
10. Find the cutoff frequency of TE_{11} mode in rectangular waveguide of dimensions $a=2$ cm and $b=1$ cm?

PART – B ($5 \times 16 = 80$ Marks)

11. a.i. Point charges 1 mC and -2mC are located at $(3, 2, -1)$ and $(-1, -1, 4)$ respectively. Calculate the electric force on a 10 nC charge located at $(0, 3, 1)$ and the electric field intensity at that point.
- ii. Express the electrostatic energy in terms of electric field intensity and electric flux density.

(OR)

- b. What are the different coordinate system used to represent field vectors? Discuss about them in brief.
12. a. Deduce the expression to find the magnetic field intensity 'H' at any point 'P' due to an infinite filamentary current carrying conductor lies in Z-axis and carrying current I ampere.

(OR)

- b. Explain in detail the various applications of Ampères circuital law.
13. a.i. Derive the Maxwell's equation in point form and integral form.
- ii. Explain the concept of displacement current.

(OR)

- b. State and prove Poynting theorem.
14. a. What is TEM wave? Derive the electric and magnetic field equation for TEM wave.

(OR)

- b.i. Explain briefly the wave impedances.

- ii. Discuss about the attenuation in parallel guide.

15. a. Explain in detail about circular waveguide. Derive the cutoff frequency of circular waveguide. And give its application.

(OR)

- b. Derive expressions for the field components of TE_{10} waves in a rectangular waveguide. Sketch the field distributions.

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