



MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :.....

Name :.....

Fourth Semester B.Sc. Degree Examination, June 2016

First Degree Programme under CBCSS

Core Course: Physics – III

AUPY441: Electrodynamics

Time: 3 Hours

Max. Marks: 80

SECTION – A

Answer ALL questions in a word or one or two sentences.

1. What is meant by dielectric polarization ?
2. Apply Gauss's law to calculate the field of a uniformly charged hollow cylinder.
3. Write the electric potential for localized charge distribution ?
4. Define Ampere's circuital law for magnetic field.
5. What are Faraday's laws for electromagnetic induction ?
6. Write down the Maxwell's equation for dielectric media.
7. What is meant by impedance of a dielectric media ?
8. Write relation between RMS value and peak value of alternating current.
9. What is meant by Q – factor of a circuit ?
10. Write a relationship between Thevenin's and Norton's equivalent circuit.

(10 × 1 = 10 Marks)

SECTION – B

Answer any EIGHT questions, not exceeding a paragraph.

11. Explain differential form of Gauss's law.
12. Derive an expression for potential energy for a uniform charge distribution.
13. Prove the statement 'the flux density of a toroid is not a constant apart from that of a solenoid'.
14. Explain Poynting theorem for electromagnetic wave.

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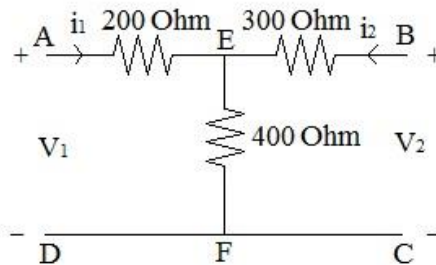
15. Explain the A.C circuit containing inductance and resistance in series.
16. Distinguish between series and parallel resonant LCR circuit.
17. Describe the working principle of Owens' bridge.
18. State and explain Maximum Power transfer theorem.
19. What are magnetic flux and magnetic torque ? How they are expressed ?
20. Trace the electric field due to finite line of charge.
21. Write the Maxwell's modification on Ampere's circuital law.
22. Derive the expression for electromagnetic waves in vacuum.

(8 × 2 = 16 Marks)

SECTION – C

Short essay type / Problems : Answer any SIX questions.

23. Explain different magnetic materials.
24. Define power factor in A.C circuit. Derive an expression for power factor in LCR Circuit.
25. Find the h parameter of the circuit given below.



26. A resistance of $10\text{K}\Omega$ is joined in series with an inductance of 0.5 Henry. What capacitance must be put in series with the combination to attain maximum current ? What will be the potential drop across each element of the circuit, if it is connected to 200V, 50Hz mains ?
27. A solenoid of 2meter long and 4cm in mean diameter. It has 10 layers of windings and 850 turns each and carries a current of 6Amp. Calculate the magnetic flux density at its centre.
28. Three charges $-4q$, q and $2q$ are respectively arranged at the three corners of a triangular having equal side length of 10cm, where charge, $q = 1.0 \times 10^{-7}$ coulomb. Calculate their mutual potential energy.

29. A plane electromagnetic sinusoidal wave has maximum intensity of electric field $200\mu\text{V/m}$. Calculate H_{max} .
30. Show that in electromagnetic wave, the electric and magnetic fields are in phase.
31. The magnetic susceptibility of medium is 948×10^{-11} . Calculate the absolute and relative permeability.

(6 × 4 = 24 Marks)

SECTION – D

Long essay type : Answer any TWO questions.

32. Applying Gauss's theorem and derive expression for the electric field (a) due to a plane sheet of charge at any point (b) due to uniformly charged sphere at a point outside, on the surface and inside the charged sphere.
33. Obtain an expression for the electric potential at an axial point, at the centre and at a point on the rim of a circular disc having uniform surface charge density.
34. State and explain Thevenin's theorem and Norton's theorem in linear circuit analysis.
35. Explain Magnetic vector potential. By applying vector potential derive an expression for magnetic flux density of a straight wire.

(2 × 15 = 30 Marks)
