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MA-1784

Sl. No.

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III Semester B.Sc. Examination, March/April - 2022

(Semester Scheme) (CBCS)

PHYSICS (Paper - III)

Electricity and Electromagnetism

Time : 3 Hours

Max. Marks : 80

*Instruction : Answer any two from part - A, and any two from part - B, any three from part - C and any ten from part - D.*

PART - A

1. a) Explain Seebeck, Peltier and Thomson effects in thermo electricity. [6]  
b) State and prove Norton's theorem. [6]
2. a) State and explain Kirchhoff's laws. [4]  
b) Define curl and divergence of a vector field. [4]  
c) State and explain Stoke's theorem. Explain its significance. [4]
3. a) Set up Maxwell's field equations in free space. [6]  
i)  $\nabla \cdot \vec{B} = 0$   
ii)  $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$   
b) What are synchrotron radiations? Explain [3]  
c) State and explain poynting theorem. [3]

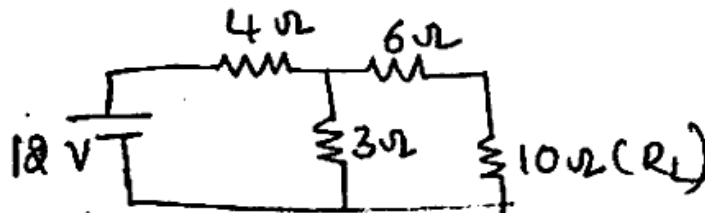
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PART - B

4. a) With neat diagram, explain the construction and working of CRO. [6]  
 b) Explain the growth of current in RL circuit. Obtain the expression for current in it. [6]
5. a) Obtain expression for instantaneous current in series LCR circuit fed with a.c. Also obtain expression for resonant frequency. [6]  
 b) Define power factor in electrical circuit. Obtain an expression for power in LCR circuit. [6]
6. a) Give the theory of Maxwell's Bridge. [5]  
 b) What is a low pass filter? Discuss the action of low pass LR filter and hence obtain an expression for cut - off frequency. [7]

PART - C

7. Using Thevenin's theorem, calculate the load current in the given circuit. [4]



8. If  $\phi(x, y, z) = 3x^2y - 2y^2z^2 + 3xz^2$ . Find grad  $\phi$  at the point  $(1, -2, 1)$ . [4]
9. An electric lamp marked 100 volts DC consumes a current of 10 amperes. It is connected to a 200 volts 50 cycles per second AC mains. Calculate the inductance of the required choke. [4]
10. In a high-pass RL filter,  $L = 100 \text{ mH}$  and  $R = 10 \text{ k}\Omega$  are connected in series. Calculate the cut - off frequency. [4]

PART - D

11. a) State the Law of intermediate temperature. [2]
- b) Explain Thomson effect. [2]
- c) Distinguish between scalar and vector fields. [2]
- d) State Ampere's circuital law. Explain. [2]
- e) Define time constant of an RC circuit. [2]
- f) Define band width and quality factor for a resonant circuit. [2]
- g) State and explain maximum power transfer theorem. [2]
- h) A series LCR circuit is called an acceptor circuit. Why? [2]
- i) Give the physical significance of gradient. [2]
- j) Define characteristic impedance of free space. [2]
- k) Define RMS value of a.c. [2]
- l) Write the circuit diagram of Anderson bridge. [2]

