U.G. 2nd Semester Examination - 2020

PHYSICS

[HONOURS]

Course Code : PHSH/CC-P-03

[PRACTICAL]

Full Marks : 20 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any **four** questions: 5×4=20

1. a) Discuss the A.C response of a pure capacitor and show in phasor diagram that emf and current are in quadrature. 2

   b) Show the phasor diagram of an imperfect capacitor under application of A.C. 1

   c) Establish that the voltages across *C, R* are related to the emf *e* according to Pythagorus theorem : $e_0^2 = V_{R0}^2 + V_{C0}^2$ where '0' indicates the peak value. 2

2. Consider a solenoid of length L and radius *a* and *n* number of turns per unit length. A current *i* flows through it. Find the self inductance of the solenoid if

   a) *L* is small / finite. $2\frac{1}{2}$

   b) *L* is very large. $2\frac{1}{2}$

3. a) State and prove Thevenin's theorem. $2\frac{1}{2}$

   b) State and prove Norton's theorem. $2\frac{1}{2}$

4. a) Mention the condition of maximum power transfer as per maximum power transfer theorem. Can it be a 100% transfer? $2\frac{1}{2}$

   b) State and prove superposition theorem. $2\frac{1}{2}$

5. Describe with a suitable theory how the self inductance of a coil can be determined with the help of Anderson bridge. 5

6. a) Consider a series LCR circuit to which an alternating voltage $e = e_0 \sin wt$ is applied. Establish the following:

      i) Current resonance occurs at angular frequency $w = \frac{1}{\sqrt{LC}}$ 1

      ii) Voltage resonance occurs at angular frequency $w = \sqrt{\frac{1}{LC} - \frac{R^2}{2L^2}}$ 2

   b) Show the current response in a series LCR circuit in the following cases through a diagram (take angular frequency as abscissa):

      i) High Q circuit 1

      ii) Low Q circuit. 1

7. a) Consider a parallel LCR circuit to which an alternating voltage $e = e_0 \sin wt$ is applied. Show the following in neat diagram:

   i) Phasor diagram at parallel resonance in low Q circuit. 1

   ii) Phasor diagram at parallel resonance in high Q circuit. 1

   b) LCR parallel circuit is called rejector circuit. Justify the name showing its current response. 2

   c) Mention one application of rejector circuit. 1

8. a) What is the difference between an ordinary galvanometer and a ballistic galvanometer? Justify the name ballistic. $1\frac{1}{2}$

   b) Discuss what you mean by damping correction of a ballistic galvanometer. How can you measure the log decrement? 2

   c) Method of leakage of the charge of a capacitor is not suitable for measuring low resistance. Explain. $1\frac{1}{2}$

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