

## U.G. 2nd Semester Examination - 2021

## PHYSICS

[HONOURS]

Course Code : PHS-H-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) State and prove reciprocity theorem.  $2\frac{1}{2}$
- b) State and prove Norton's theorem.  $2\frac{1}{2}$
2. 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.  $2\frac{1}{2}$
3. 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

4. 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.  $2\frac{1}{2}$
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  $e = e_0 \sin \omega t$  is applied. Establish the following:
  - i) Current resonance occurs at angular frequency  $\omega = \frac{1}{\sqrt{LC}}$  1
  - ii) Voltage resonance occurs at angular frequency  $\omega = \frac{1}{\sqrt{\frac{L}{C} - \frac{R^2}{2L^2}}}$  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

[Turn over]

7. a) Consider a parallel LCR circuit to which an alternating voltage  $e = e_0 \sin \omega t$  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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