

1-6-2024



**DOON UNIVERSITY, DEHRADUN**  
**End Semester Examination, 2<sup>nd</sup> Semester, 2024**  
**Academic Year 2023-24 (Even Semester)**  
**School of Physical Science, Department Physics**  
**Programme Name: B. Sc. Honors with Research 2<sup>nd</sup> Sem**  
**Course Code: Electrical Circuit Analysis (PHC 153)**

Time Allowed 2.0 Hours

Maximum Marks: 30

Note: All questions are compulsory and marks are indicated in front of each section.

**SECTION: A**

(Very Short Answer Type Questions;  $1 \times 6 = 6$ )

**Q1.** Q-factor for resonance RLC series circuit

- A.  $\frac{1}{R} \sqrt{\frac{C}{L}}$
- B. 0
- C.  $\frac{1}{R} \sqrt{\frac{L}{C}}$
- D.  $R \sqrt{\frac{C}{L}}$

**Q2.** Relationship between rms value and peak value of an AC voltage

- A.  $V_{rms} = 0.707V_p$
- B.  $V_p = 0.707V_{rms}$
- C.  $V_{rms} = V_p$
- D. None of the above

**Q3.** Conversion of radians in degrees

- A. Radians =  $\left(\frac{\pi}{180^\circ}\right) \times \text{degrees}$
- B. Radians =  $\left(\frac{180^\circ}{\pi}\right) \times \text{degrees}$
- C. Radians =  $\left(\frac{22}{\pi}\right) \times \text{degrees}$
- D. Radians =  $\left(\frac{\pi}{22}\right) \times \text{degrees}$

**Q4.** Condition of resonance for any series RLC circuit

- A.  $X_L > X_C$
- B.  $X_L < X_C$
- C.  $X_L = X_C$
- D. None of the above

Q5. Value of inductive reactance  $X_L$

- A.  $2\pi fL$
- B.  $fL$
- C.  $\frac{2\pi f}{L}$
- D.  $\frac{2\pi L}{f}$

Q6. An AC series circuit has a resistance of  $10 \Omega$ , an impedance of  $0.2 \text{ H}$  and a capacitance of  $60 \mu\text{F}$ . Then resonant frequency of the given circuit

- A. 20 Hz
- B. 46 Hz
- C. 64 Hz
- D. 26 Hz

#### SECTION: B

(Short Answer Type Questions;  $4 \times 3 = 12$ )

- Q1. Define peak amplitude, peak to peak value, time period, cycle, frequency for sinusoidal AC voltage along with its characteristics.
- Q2. What are the advantages of AC over DC.
- Q3. Explain the transient response of series RL circuit for DC excitation.
- Q4. Draw a wave and phasor diagrams for purely resistive, inductive and capacitive AC circuits.

#### SECTION: C

(Long Answer Type Questions;  $2 \times 6 = 12$ )

- Q1. State and prove superposition theorem for any electrical network.
- Q2. For any series RLC circuit derive the expression for impedance and phase angle. Also explain the condition for resonance, bandwidth and quality factor for the same circuit.