**7-ALTERNATING CURRENT AND ELECTRICAL MACHINES**

**1. (i) Mean (ii) Effective (iii) Instantaneous Values of Alternating Currents and Voltages**

1. Instantaneous value of a.c. *I = I0* *sin ωt,* where *I0* is the peak or maximum value of a.c. 2. Average or mean value of a.c. over half cycle,  3. Effective or rms or virtual value of a.c. or *Irms* or  4. For alternating voltages, we have 

**2. (i)Inductive reactance (ii) Capacitive reactance**

1. For an a.c. circuit containing inductor only, (i) Inductive reactance, *f* L (ii) Current amplitude,  (iii) Effective current,  2. For an a.c. curcuit containing capacitor only, (i) Capacitive reactance,  (ii) Current amplitude,  (iii) Effective current, 

**3. Series LR-Circuit**

1. Impedance,  2. Current,  3. Phase angle is given by  or  4. Instantaneous current, 

**4. Series CR-Circuit**

1.Impedance,  2. Current,  3. Phase angleis given by  or  4. Instantaneous current, 

**5. Series LCR- Circuit, its Resonance and Q-factor**

1. Impedance of a series LCR-circuit.  2. Phase anglebetween current and voltage is given by  or  3. Resonant frequency of LCR-series circuit (when XL = XC)  4. Q-Factor =  where ω1 and ω2 are the frequencies at which current falls to times its resonant value.

**6. Energy and Power associated with A.C. Circuits**

1. Average power consumed per cycle in any a.c. circuir,  is the apparent power 2. Power factor,  3. Average power consumed per cycle in a ppure resistive circuit,  3. Energy stored in an inductor,  5. Average power consumed per cycle in pure inductive circuit = 0 6. Energy stored in a capacitor,  7. Average power consumed per cycle in a pure capacitive circuit = 0. 8. For an LCR in resonance and 

**7. LC-Oscillations**

1. Angular frequency of free oscillations of an LC-circuit.  2. Frequency of free oscillations of an LC-circuit,  3. Instantaneous charge on the capacitor,  4. Instantaneous current in the LC-circuit , where  5. Electrical energy stored in the capacitor at any instant, 

 6. Magnetic energy stored in the inductor at any instant,   7. Total energy stored in the LC-circuit, 

**8. Transformers and Long Distance Power Transmission**

1. The voltages and currents in a transformer are related as  u where suffix 1 refers 1 to primary coil, 2 to secondary coil and *k* is the transformation or turns ratio. 2. (Power in primary coil) (Power in secondary coil) 3. Efficiency o a transformer  4. Power is transmitted from power stations to sub-stations at very high voltages to reduce cost reduce losses.

**9. Generators**

For an a.c. generator, 1. Flux linked,= *NBA cos ωt* 2.Instantaneous induced emf,  3. Maximum induced emf,  4. Instantaneous current,  5. Maximum current, 