

PART-B
(ELECTRICAL AND MECHANICAL)
SECTION - I (ELECTRICAL)

1. (a) Two coils connected in series have a resistance of 18Ω and when connected in parallel have a resistance of 4Ω . Find the value of coil resistances. (10)
- (b) Write the unit of measurement and the name of instrument used for the measurement of the following :
- (i) Earth resistance (ii) Flux (iii) Electric power (iv) Charge and (v) Speed (10)
- (c) Give comparison of conductor materials used in transmission and distribution systems. (10)
2. (a) State and explain Thevenin's theorem. (10)
- (b) A 6 - poles lap wound armature of a d.c. generator has 600 conductors. The flux per pole is 20 mwb. Calculate :
- (i) The speed at which generator must be driven to generate 300 V. and
(ii) What would be the speed if generator is wave connected ? (10)
- (c) Compare an induction motor and a synchronous motor based on the following :
- (i) Starting and Speed of operation (4)
(ii) Rotor construction and (3)
(iii) Applications. (3)
3. (a) Calculate the value of load resistance R_L to which maximum power may be transferred from the circuit shown in Fig. 1. Determine also the value of maximum power. (15)

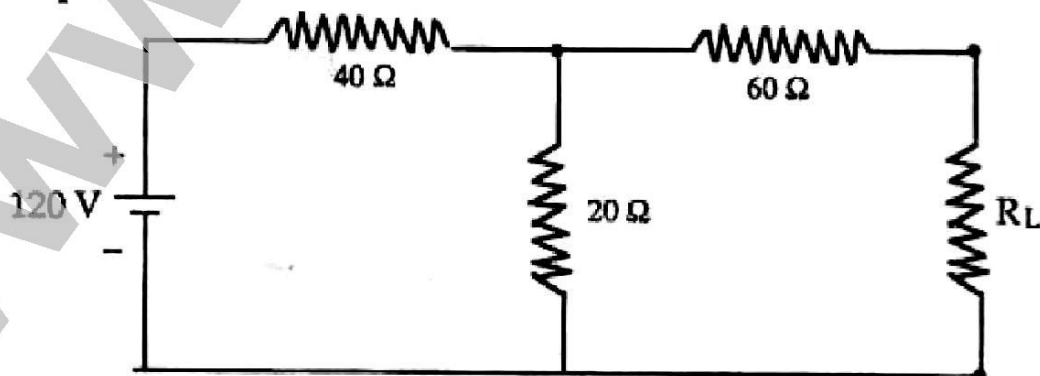


Fig.-1

(b) Explain construction and working of moving iron instruments. Also discuss their advantages, disadvantages and applications. (15)

5. (a) A 40 KVA transformer has iron loss of 450 W and full load copper loss of 850 W. If the power factor of the load is 0.8 lagging, calculate :
(i) the full load efficiency
(ii) the load at which maximum efficiency occurs and
(iii) the maximum efficiency. (15)

(b) What is a circuit breaker ? How does it differ from a fuse ? Why is a circuit breaker specified in MVA ? (15)

(a) What is the percentage saving of copper if line voltage in a two-wire dc. system is raised from 220 V to 500 V for the same power ? State assumptions made. (10)

(b) Draw the torque-slip characteristic of a 3-phase induction motor. Also show the effect of rotor resistance on it. (10)

(c) State and explain Faraday's law of electromagnetic induction and mention its applications. (10)

6. (a) A choke coil takes a current of 2.5 A when connected across 250 V, 50 Hz mains and consumes 400 W. Calculate : (10)

- (i) Power factor and
(ii) resistance and inductance of coils.

(b) A 3-phase, 4 pole, 50 Hz induction motor has a rotor current of frequency 2 Hz. Determine :
(i) the slip and
(ii) the speed of motor. (10)

(c) List four possible ways of connecting a bank of three phase transformer for three phase services. State applications of each. (10)

7. (a) Why a d.c. motor draws high current at starting ? Explain with neat diagram, construction and working of a d.c. motor starter. (10)
- (b) Define voltage regulation of an alternator. Also describe synchronous impedance methods of its determination. (10)
- (c) The equation of an alternating current is given by
 $i = 141.4 \sin 314 t$. Find,
(i) rms current (ii) frequency and (iii) instantaneous value of current when
 $t = 3.6 \text{ m sec.}$ (4 + 3 + 3)