# B.Tech-1st

## Basic Electrical Engineering

*Full Marks : 50*

*Time : $2\frac{1}{2}$ hours*

Answer **all** questions

*The figures in the right-hand margin indicate marks*

Symbols carry usual meaning

1.  Answer *all* questions :                    2×5

    (a) Two filament lamps A and B take 0.8 A and 0.9 A respectively when connected across 110 V supply. Calculate the value of current when they are connected in series across a 220 V supply.

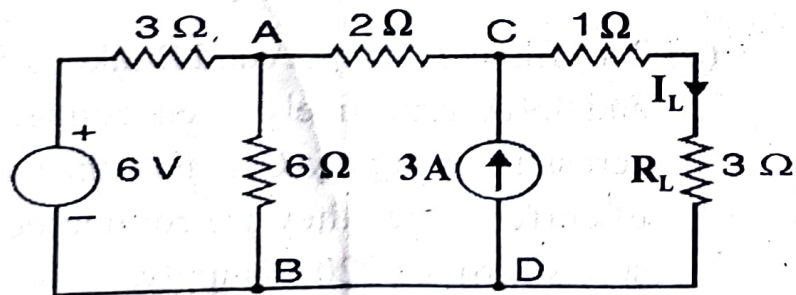    (b) Find the effective value of

    $$v(t) = 50 + 70.7\cos(377t)V.$$

(c) What are the different speed control methods of DC motor ?

(d) State the EMF equation for a single phase transformer with proper notion.

(e) What are energy sources used in India ? Give some examples.

2. (a) Using Source conversion technique find the load current $I_L$ in the circuit shown    4
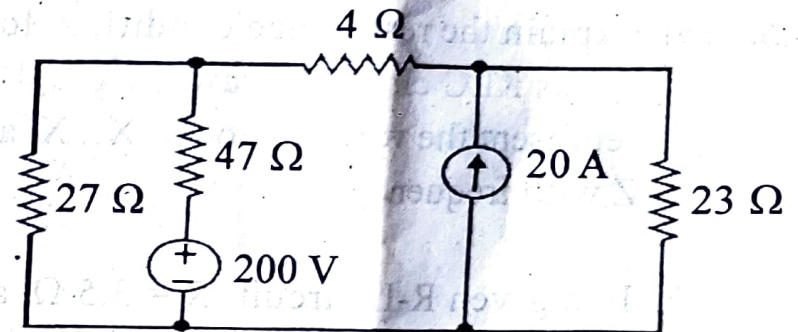


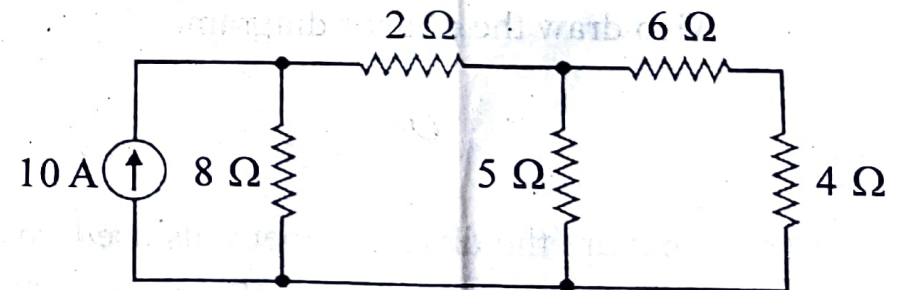(b) Using superposition Theorem find the current through 23 $\Omega$.    4

Or

(a) Using Norton's Theorem find current through 5 $\Omega$ resistor in the circuit shown    4



(b) State & Explain Maximum Power Transfer Theorem.    4

( 4 )

3. (a) Explain the resonance condition for a series RLC circuit. Draw the graph to represent the variation of R, $X_L$, $X_c$ and Z with frequency.    4

(b) In a given R-L circuit, R = 3.5 $\Omega$ and L = 0.1 H.    4

Find :

(i) the current through the circuit and

(ii) power factor if a 50-Hz voltage V = 220∠30° is applied across the circuit.

Also draw the phasor diagram.

Or

(a) What are the different methods used to measure power in a three-phase circuit ? Explain the two watt-meter method with proper diagram.    4

( 5 )

(b) A balanced star-connected load of (8+j7) $\Omega$ per phase is connected to a balanced 3-phase 400 V supply. Find the line current, power factor, power and total apparent power.    4

4. (a) Derive torque equation of DC motor.    4

(b) A coil is wound uniformly with 300 turns over a steel ring of relative permeability 900 having a mean diameter of 20 cm and cross section of 2 cm diameter. Current in the coil is 5A. Calculate (i) MMF, (ii) Reluctance (iii) field intensity in the ring (iv) flux (v) permeance.    4

Or

(a) What is hysteresis loss ? In which type of machine it occurs ? On which factors it depend ?    4

(b) A 4 pole wave wound armature has 720 conductors and is rotated at 1000 rpm. If useful flux is 20 mWb, Calculate the generated voltage.     4

5. (a) Find the full-load rotor slip and frequency of the induced voltage at rated speed in a four-pole induction motor with ratings : 230 V; 60 Hz; full-load-speed : 1,725 r/min.     4

(b) How power in transferred in a single phase transformer ? Why the frequency remains constant ?     4

Or

(a) A 220-V DC shunt motor has an armature resistance of 0.2 ohm and a rated armature current of 50 A. Find (i) The voltage generated in the armature, (ii) The power developed.     4

(b) What is the principle of operation of a DC generator ? Explain the motoring operation in a DC generator.     4

6. (a) What are the available sources of energy ? Why is electrical energy so popular ?     4

(b) Give a brief idea about the electrical power system and its components.     4

Or

(a) Why do we go for poly-phase AC system over DC system ?     4

(b) Give a general layout of a hydro-electric power station.     4

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