B.Tech

(SEM I) ODD SEMESTER THEORY EXAMINATION 2009-10

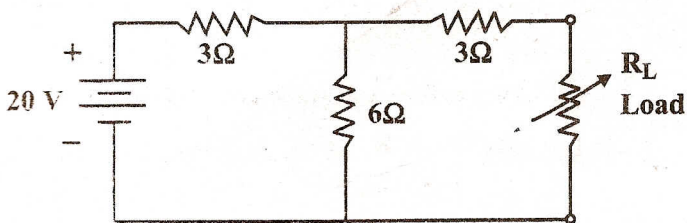### ELECTRICAL ENGINEERING

Time : 3 Hours]   [Total Marks : 100

SECTION - A

1   Attempt all parts of the following :   10×2=20

(Fill in the blanks/choose/match)

(i)   The maximum power that can be supplied to the load in the following circuit is

(a)   10 W

(b)   20 W

(c)   30 W

(d)   40 W

(ii) The coupling between two magnetically coupled coils is said to be the ideal if the coefficient of coupling is

    (a) Zero

    (b) 0.5

    (c) 0.75

    (d) 1

(iii) A sinusoidal current having rms value of $8 \angle 0°$ A is added to another sinusoidal current of rms value $6 \angle 90°$A. The rms value of the resultant current is _____

(iv) Which of the following conditions is common to both series and parallel resonance?

    (a) curent is maximum

    (b) power is low

    (c) impedance is minimum

    (d) power factor is unity

(v) Which of the following formulae is used to express active power in a balanced three-phase circuit?

    (a) $V_L I_L \cos \phi$

    (b) $\sqrt{3} \ V_L I_L \cos \phi$

    (c) $V_{ph} I_{ph} \cos \phi$

    (d) $\sqrt{3} \ V_{ph} I_{ph} \cos \phi$

(vi) A moving coil instrument gives full scale deflection with 20 mA. The resistance of coil is 4 ohm. The value of series resistance needed for the instrument to read upto 30 V is _____.

(vii) A 100 kVA single phase transformer operating at 0.9 power factor has 90% maximum efficiency. The iron loss will be _____.

(viii) A 4-pole lap wound dc generator generates 200 V at 1000 rpm. If this generator is now wave wound and runs at 500 rpm, the generated voltage will be _____.

(ix) A 3-phase induction motor connected from a 3-phase, 50 Hz ac supply runs at 720 rpm and has 4% slip. The number of poles in the motor are :
   (a) 4
   (b) 6
   (c) 8
   (d) 16

(x) Match the following (marks will be awarded if all matching are correct) :

| Type of Motor		Application
(i) dc series motor	(a)	Centrifugal pumps
(ii) Synchronous motor	(b)	Cranes
(iii) 3-phase squirrel cage induction motor	(c)	Hair dryer
(iv) Single phase shaded pole motor	(d)	Condenser

SECTION - B

2 Attempt any three parts of the following : 10×3=30

(a) (i) Determine current in 4 ohm resistance using Thevenin's theorem in the following circuit :
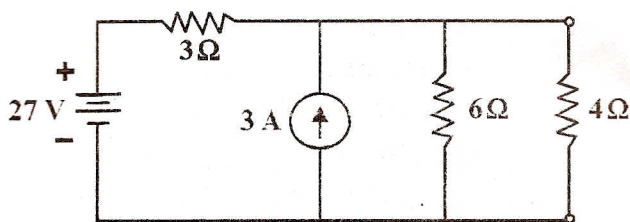
(ii) Find voltage V_1 across 6 ohm resistance in the following circuit using loop analysis method :
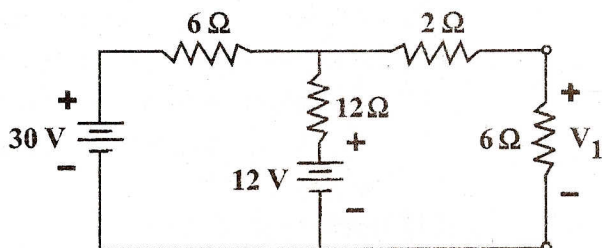
(b) A coil having a resistance of 6 ohm and an inductance of 0.0255 H is connected across a 230 V, 50 Hz ac supply. Calculate

(i) current

(ii) power factor

(iii) active power

(iv) reactive power

(v) apparent power

(vi) It is desired to improve power factor to 0.8. What value of capacitance to be connected in series R and what is reduction in reactive power?

(c) A balanced star connected iductive load is connected to a 400 V, 50 Hz ac supply. Two wattmeters used to measure supply power indicate 8000 W and 4000 W respectively. Determine

(i) line current

(ii) impedance of each phase

(iii) resistance and inductance of each phase.

(d) A 20 kVA, 2000 V/200 V, single phase 50 Hz transformer has a primary resistance of 1.5 ohm and a reactance of 2 ohm. The secondary resistance and reactance are 0.015 ohm and 0.02 ohm respectively. The no load current of transformer is 1 A at 0.2 power factor. Determine

(i) equivalent resistance, reactance and impedance referred to primary

(ii) supply current

(iii) total copper loss.

Draw approximate equivalent circuit.

(e) A dc shunt generator delivers 50 kW at 250 V when running at 500 r.p.m. The armature and field resistances are 0.05 ohm and 125 ohm respectively. Calculate the speed of the same machine and developed torque when running as a shunt motor and taking 50 kW at 250 V. Allow 1 volt per brush for contact drop.

SECTION - C

Note : Attempt all questions of this section. **10×5=50**

3 Attempt any two parts of the following :

(a) State and explain superposition theorem.

(b) Discuss different types of voltage and current sources.

(c) Explain star-delta transformation.

4 Attempt any two parts of the following :

(a) Explain parallel resonance and draw graphs of α, β and γ against frequency.

(b) What is meant by power factor? What is its significance? How will you obtain power factor from kVA triangle?

(c) For two phasors $A = a_1 + jb_1$ and $B = a_2 - jb_2$, obtain their multiplication and division using polar form of representation.

5 Explain construction and working principle of a single phase induction type energy meter. How is energy measured?

OR

What is a three phase system? Give its necessity and advantages. What is meaning of phase sequence and how can it be changed?

6 Attempt any two parts of the following :

(a) Draw and explain hysteresis loop. What is its significance?

(b) Explain single phase autotransformer and give its application.

(c) Derive e.m.f. equation of a single phase transformer and obtain relation for secondary to primary winding voltages.

7 Attempt any two parts of the following :

(a) Derive an equation for generated torque in dc motor.

(b) Draw slip-torque characteristics of a three phase induction motor and explain its various regions of operation.

(c) Explain principle of operation of a synchronous motor and give its applications.

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