B. Tech.
(Semester-II) Even Semester Theory Examination, 2012-13
ELECTRICAL ENGINEERING

Time : 3 Hours] 

[Total Marks : 100

Note : Attempt questions from each Section as per instructions.

SECTION - A
Attempt all parts of this question. Each part carries 2 marks.

1. (a) How a voltage source is converter into current source?
(b) What happens if the field winding of a running shunt motor suddenly breaks open?
(c) A series circuit has \( R = 10 \Omega, L = 0.01 \, H \) and \( C = 10 \, \mu F \). Calculate \( Q \)-factor of the coil.
(d) If the current in the armature of a d.c. series motor is reduced by 5%, what will be the torque of the motor?
(e) What is the typical use of an autotransformer?
(f) The full load copper less and iron loss of a transformer are 6400 W and 5000 W respectively. Calculate above losses at half-load.
(g) Give the application of synchronous motor.
(h) Name the meter used for measuring electrical energy of consumer.
(i) An induction motor has a rated speed of 715 r.p.m. Calculate its poles and slip.
(j) How many wattmeter(s) (minimum) are required to measured 3-phase 3-wire balanced power? Give diagram.

2. (a) State and explain maximum power transfer theorem. Also derive an expression of maximum power of it.
(b) An alternating current of 1.5A flows in a circuit when applied voltage is 300V. The power consumed is 225W. Find the resistance and reactance of the circuit.
(c) Derive an expression for the resonance frequency of the series RLC resonance circuit. Also draw the phasor diagram for the same.

P. T. O.
(d) A 250 V d.c. shunt motor having an armature resistance of $0.25 \Omega$ carries an armature current of 50A and runs at 750 rpm. If the flux is reduced by 10%, find the speed. Assume that the torque remains the same.

(e) In a 2-wattmeter method, power measured was 30 kW at 0.7 pf lagging. Find the reading of each wattmeter.

SECTION -C

Attempt all questions of this Section. Each question carries 10 marks. $10 \times 5 = 50$

3. Derive the relation between line and phase voltage for a star-connected 3-phase balanced system.

Or

A balanced delta connected load of $(8+j6) \Omega$ per phase is connected to a 3-phase 440 V supply. Find the line current.

4. Attempt any two parts of the following:
Why the synchronous motor is not self starting? Discuss the constructional details of salient pole synchronous generator.

Or

Derive an expression of voltage induced in an alternator per phase. Differentiate between salient pole and cylindrical motor alternator.

5. Compare a 3-phase induction motor with single phase induction motor on the basis of following:
(i) Starting torque
(ii) Slip-torque characteristic
(iii) Magnetic field
(iv) Applications.

6. A 400/200V transformer takes 1 A at a power factor of 0.4 on no-load. If the secondary supplies a load current of 50A at 0.8 lagging power factor, calculate the primary current.

Or

A voltage $v=200 \sin 314t$ is applied to the transformer winding in a no-load test. The resultant current is found to be $i=3 \sin (314t-60^\circ)$. Determine the core loss and the parameters of no load approximate equivalent circuit.

7. A series RLC circuit has $R=10 \Omega$, $L=0.1 \, H$ and $C=8 \mu F$. Determine resonant frequency, $Q$-factor at resonance and half power frequency.

Or

Three sinusoidal voltages acting in series are given by:

$V_1 = 10 \sin 440t$

$V_2 = 10 \sqrt{2} \sin (440t-45^\circ)$

$V_3 = 20 \cos 440t$.

Determine an expression for the resultant voltage and frequency and r.m.s. value of resultant voltage.