

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1117

Roll No.

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**B. Tech.**

**(Semester-I) 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.  $2 \times 10 = 20$

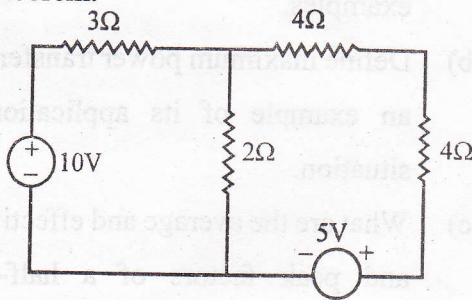
1. (a) Differentiate active and passive elements with examples.
- (b) Define maximum power transfer theorem. Give an example of its application in practical situation.
- (c) What are the average and effective values, form and peak factors of a half-wave rectifier voltage?

- (d) Differentiate between star and delta three phase connections.
- (e) Give the block diagram of multimeter.
- (f) Give analogy between electric and magnetic circuits.
- (g) Draw the equivalent circuit of single phase transformer.
- (h) Give the role of back emf in DC motor. How does its value changes with increase in load ?
- (i) Justify rotor of three phase induction motor cannot run at synchronous speed.
- (j) Draw V-curves of synchronous motor with increasing load.

**Section-B**

Attempt any *three* parts of this question. Each part carries 10 marks.  $10 \times 3 = 30$

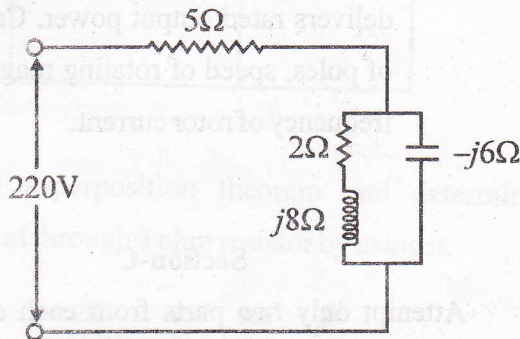
2. (a) Define Thevenin's theorem. Give its limitations. Find the current in 2 ohm resistor using this theorem.



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(2)

- (b) Define apparent, active and reactive powers, power factor in AC circuits. Compute the powers in each element of the circuit shown.



- (c) Derive the relationship between phase voltage and line voltage in star connected three phase system. If a three phase 100V, 50Hz balanced supply system is feeding to a balanced delta connected load of  $10 \angle 45^\circ$  ohm, find the phase and line currents.
- (d) Explain the operation of single phase transformer at load. A single phase 10kVA, 11000/220 V transformer has core loss 300 W at rated voltage and copper loss 400W at full load. Find the efficiency of transformer feeding to a load 8kVA at 0.8 p.f. lagging. What will be the maximum efficiency of the transformer?

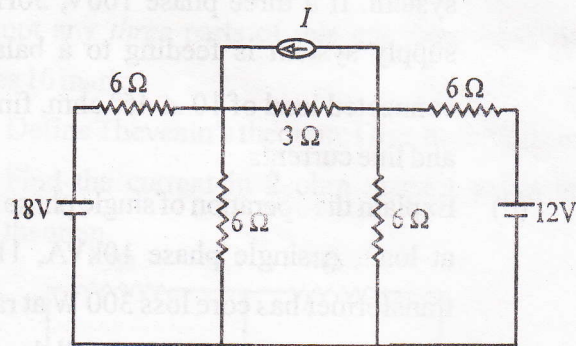


- (e) Draw torque-slip characteristics of three-phase induction motor. A three-phase, 440V, 50hp, 50Hz induction motor runs at 1450 rpm when it delivers rated output power. Calculate number of poles, speed of rotating magnetic field, slip, frequency of rotor current.

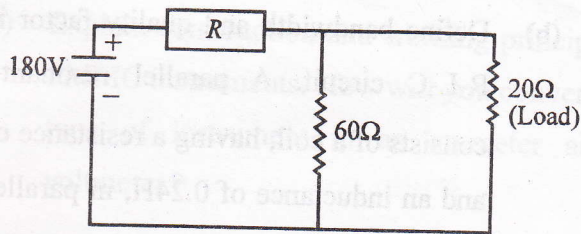
### Section-C

Attempt only *two* parts from each question of this Section. Each question carries 10 marks.  $10 \times 5 = 50$

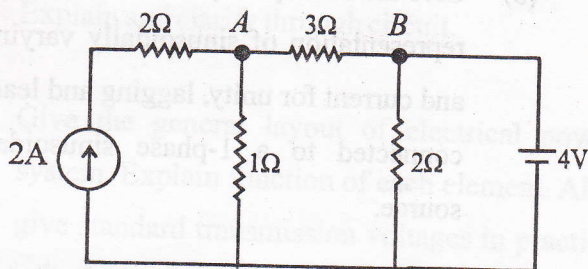
3. (a) Find current  $I$  by applying nodal-voltage analysis.



- (b) Determine the value of  $R$  so that the load of  $20\Omega$  draws maximum power and the value of maximum power drawn by the load.



- (c) State superposition theorem and determine current through 3 ohm resistor by using it.



4. (a) A coil having a resistance of  $15\Omega$  and inductance of  $0.2\text{H}$  is connected in series with another coil having a resistance of  $25\Omega$  and inductance of  $0.04\text{H}$  to a  $230\text{ V}$ ,  $50\text{Hz}$  supply.

Determine :

- (i) Voltage across each coil
- (ii) The power dissipated in each coil
- (iii) The power factor of whole circuit.

(b) Define bandwidth and quality factor in series R-L-C circuit. A parallel resonant circuit consists of a coil, having a resistance of  $150 \Omega$  and an inductance of  $0.24\text{H}$ , in parallel with a lossless capacitor of capacitance  $3 \mu\text{F}$ . Find its resonance frequency, Q-factor and bandwidth.

(c) Give the concept of phasors. Explain the phasor representation of sinusoidally varying voltage and current for unity, lagging and leading loads connected to a 1-phase sinusoidal voltage source.

5. (a) Explain two-wattmeter method of measuring three-phase power consumed by three-phase load. Two-wattmeter method was used to determine the input power to a three-phase motor. The readings were  $5.2\text{kW}$  and  $-1.7 \text{kW}$ , and the line voltage was  $415 \text{V}$ . Calculate :

- (i) Total power
- (ii) Power factor
- (iii) Line current.



- (b) Explain construction and working principle of PMMC instruments. How will you convert this type of instrument in an ammeter and a voltmeter?
- (c) Give the block diagram representation of megger and give the function of each block. How does this instrument is used in practical use? Explain and clarify through circuit.
6. (a) Give the general layout of electrical power system. Explain function of each element. Also give standard transmission voltages in practice in India.
- (b) A circular ring of mean length  $4\pi$  cm and of cross-sectional area  $10\text{cm}^2$  has an air gap  $0.4\pi$  mm long. The relative permeability of iron is 1000. The ring is wound with a coil of 2000 turns. Determine the flux in the air gap, if the coil carries a current of 2mA. Also find the inductance of the coil.

(c) Explain the basic principle of operation of auto-transformer. Give its applications.

7. (a) Derive emf equation of DC machine. Explain different operating characteristics and applications of DC motors.

(b) Why single phase induction motor is not self starting? Explain any one method to start it and give the procedure to reverse the direction of rotation.

(c) Explain principle of operation of alternator. Give the applications of synchronous motor.