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

PAPER ID : 2301 Roll No. | | | | | | | | | | |

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.   2×10=20

1.   (a)   Differentiate active and passive elements with examples.

      (b)   Define maximum power transfer theorem and give its application in practical situation.

      (c)   What is 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 importance of improving the p.f. of a 1-ph AC circuit. Explain with circuit and phasor diagram.

(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 change with decrease 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.   10×3=30

2. (a) Define Norton's theorem. Give its limitations. Find the current in 2 ohm resistor using this theorem.
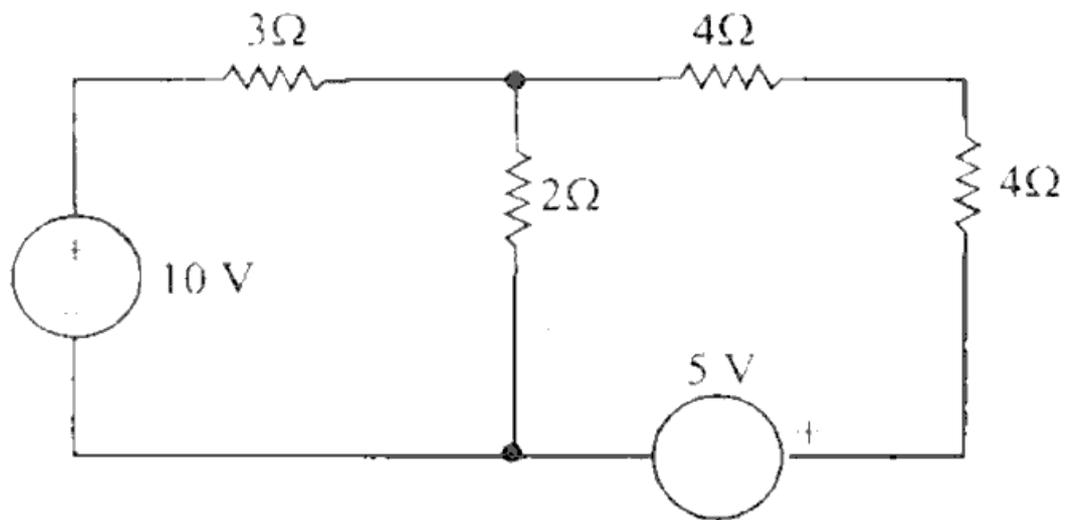
(b) Define apparent, active and reactive powers, power factor in AC circuits. Compute the powers in each elements of the circuit shown.
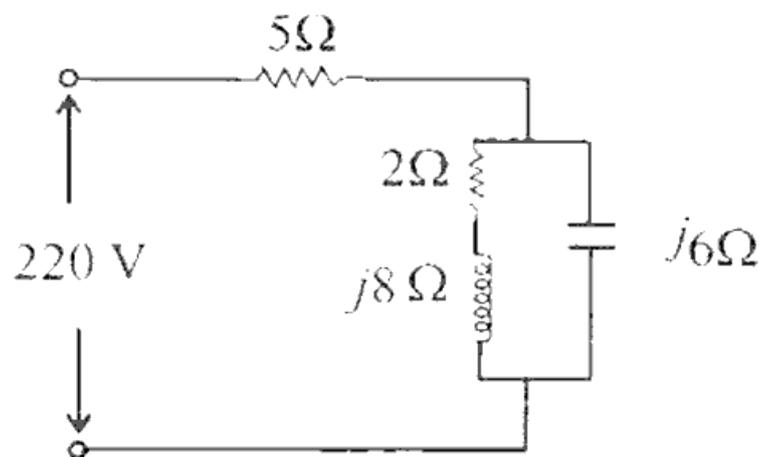

(c) Derive the relationship between phase voltage and line voltage in star connected three phase system. If a three phase 100 V, 50 Hz balanced supply system is feeding to a balanced delta connceted load of $10 \angle 45°$ ohm. Find the phase and line current.

(d) Explain the operation of single phase transformer at load. A single phase 10 kVA, 11000/220 V transformer has core loss 300 W at rated voltage and copper loss 400 W at full load. Find the effeciency of transformer feeding to a load 8 kVA at 0.8 p.f. lagging. What will be the maximum effeciency of the transformer?

(e) Draw torque-slip characterstics of three phase induction motor. A three-phase, 440 V, 50 hp, 50 Hz 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.
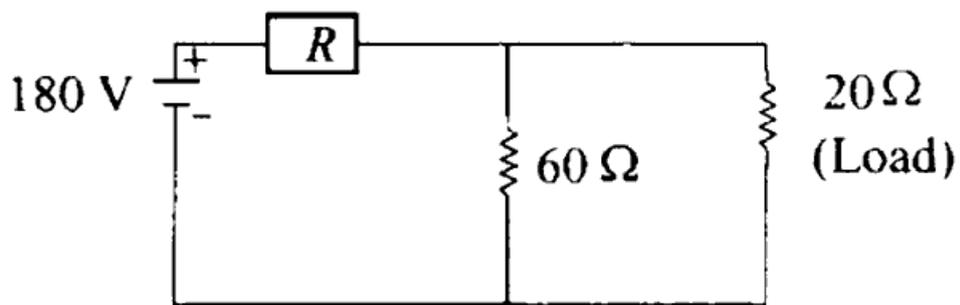
Section-C

Attempt only *two* parts from each question. Each question carries 10 marks.   10×5=50

3. (a) Find current I by applying nodal-voltage analysis.
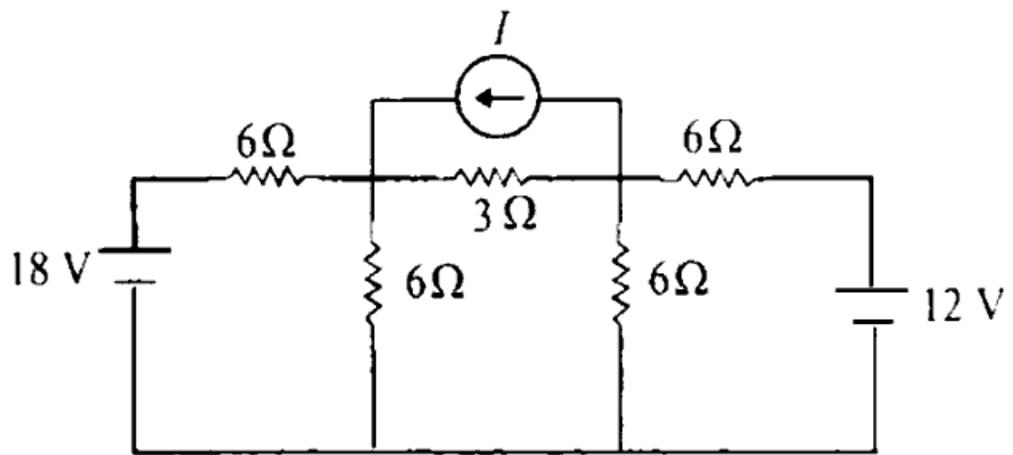
(b)   Determine the value of R so that the load of 20 Ω draws maximum power and the value of maximum power drawn by the load.

(c)   State superposition theorem and illustrate its use to solve a network.

4.   (a)   A coil having a resistance of 15 Ω and inductance of 0.2 H is connected in series with another coil having a resistance of 25 Ω and inductance of 0.04 H to a 230 V, 50 Hz supply. Determine :

        (i)   Voltage across each coil

(ii) The power disipated 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 Ω and an inductance of 0.24 H, in parallel with a lossless capacitor of capacitance 3 μF. 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 lead p.f. loads, connected to a 1-phase sinusoidal voltage source.

(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 kW and −1.7 kW, and the line voltage was 415 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 into an ammeter and a volteter.

(c) A 1-phase energymeter makes 500 revolution for kWh. On lesting, it is found to make 40 revolutions in 58.1 seconds at full load of 5 kW. Determine the percentage error.

6. (a) Give the general layout of electrical power system. Explain function of each element. Also give standard transmission voltage in practice in India. https://www.aktuonline.com

(b) A circular ring of mean length 4π cm and of cross sectional area 10 cm^2 has an air gap 0.4π 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 2 mA. Also find the value of inductance of the coil.

(c) Explain the basic principle of operation of autotransformer. 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 as well the way you can reverse the direction of its rotation.

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