**EE-101**

**Roll No.** | | | | | | | | | | |

# B.Tech

## (SEM- I) ODD SEMESTER EXAMINATION, 2015-16

## ELECTRICAL ENGINEERING

*Time: 3 Hours* *Maximum Marks: 100*

**Note:** *Attempt all questions.*

**Q.1.** *Attempt any **Four** parts of the following.* **5x4=20**

a) Explain with examples the meanings of the following terms
   i. Ideal and practical current sources
   ii. Unilateral and Bilateral elements

b) Explain the concept of source transformation taking a suitable example. When can it not be done? Explain.

c) For the circuit shown in figure, find the current through the resistance R connected between points 'a' and 'b' in fig.1, by Thevenin's theorem

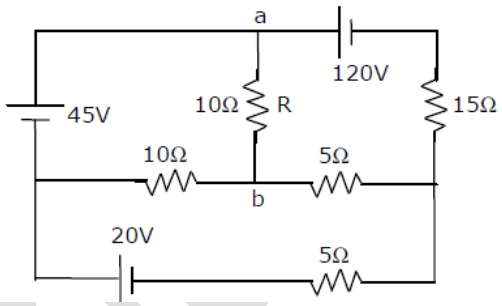


Figure 1

d) State and prove the maximum power transfer theorem. What is the efficiency of power transfer at the time of maximum power transfer?

e) Derive the expression for the Star- Delta transformation.

f) Find the current through the 4 ohm resistor in the circuit shown in fig.2

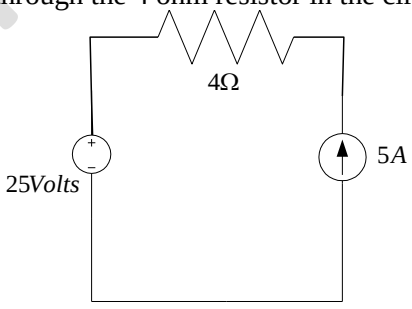


Figure 2

**Q.2.** *Attempt any **TWO** parts of the following.* **10x2=20**

a) Explain the concept of phasor. Derive the relationships between the voltage and current phasors for a purely resistive, inductive, capacitive, R-L and R-C loads.

Can the phase angle between voltage and current phasors be more than 90 degrees? Explain.

b) Define the significance of power factor in the entire power system. A series R-L circuit is having resistance of 4 ohms and the inductive reactance of 3 ohms. The supply frequency is 50 Hz. Find the difference between the values of the capacitors required to make the power factor unity when
   i. The capacitor is connected in series with the R-L circuit and
   ii. The capacitor is connected in parallel with the R-L circuit across the supply

c) In a series R-L-C circuit fed with a variable frequency AC voltage source, find the expression of the frequency at the time of occurrence of maximum voltage across the inductor.

**Q.3.** *Attempt any **TWO** parts of the following.* **10x2=20**

**(a)** In the three phase power measurement by two wattmeter method, find how the three phase real and reactive powers are found. In one such measurement the reading of one wattmeter was found to be twice that of the other one. Find the power factor of the load.

**(b)** Explain the principle of operation of a Moving Iron instrument. What value of the input signal does it measure and why? Explain how PMMC instrument shows zero reading when a pure sine wave is input in it.

**(c)** Why does a wattmeter starts showing negative reading when the power factor of the load in three phase power measurement by two wattmeter method becomes <0.5? Explain with the help of relevant phasor diagrams.

**Q.4.** *Attempt any **TWO** parts of the following.* **10x2=20**

a) Explain the differences between the Magnetic and Electric circuits. Also explain the difference between permittivity and permeability.

b) Derive the expression of the induced voltage in a single phase transformer. Draw the equivalent circuit and explain the reason behind each of the components present in the equivalent circuit of the transformer.

c) A 10 KVA, 1000/500 volts, 50 Hz, single phase transformer has a maximum efficiency of 98% at full load, 0.8 power factor lagging. Find
   i. The efficiency at 90% full load, unity power factor
   ii. The copper losses at each of the above two mentioned cases.

**Q.5.** *Attempt any **FOUR** parts of the following.* **5x4=20**

a) Explain the principle of operation of a three phase Induction motor. Mention some of its applications.

b) Explain why a single phase Induction motor is not self starting? Mention one starting methods of the single phase Induction motor.

c) Explain the principle of operation of a DC motor. Derive the expression of Torque for a DC motor.

d) Explain how a Synchronous motor is NOT self starting.

e) Derive the expression of induced emf in a DC generator. What are the two types of windings in the armature of the DC generator?

f) Explain the two major principles involved in the electromechanical energy conversion.