Code No: 113BR

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, December-2014
BASIC ELECTRICAL ENGINEERING
(Common to CSE, IT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

Part- A **(25 Marks)**

1.a) State and explain KCL and KVL. [2M]
b) State and explain Norton's theorem. [3M]
c) Define RMS and Average value of an alternating quantity. [2M]
d) A coil has a resistance of 4 Ω and an inductance of 9.55 mH. Calculate (i) the reactance, (ii) the impedance, and (iii) the current taken from a 240 V, 50 Hz supply. [3M]
e) Why rating of the transformer is given in KVA? Explain. [2M]
f) Draw and explain the phasor diagram of single phase transformer on no load. [3M]
g) Explain the principle of DC motor operation. [2M]
h) Write the similarities between transformer and induction motor. [3M]
i) What are the different types torques acting on the moving system of measuring instrument? [2M]
j) Explain how the deflecting torque provided in a moving system of a measuring instrument? [3M]

Part-B **(50 Marks)**

2.a) For the circuit shown in Figure 1, calculate the current I and voltage V_{ab} when
i) $R_x = 0\ \Omega$ ii) $R_x = 15\ K\Omega$ iii) $R_x = \infty\ \Omega$.

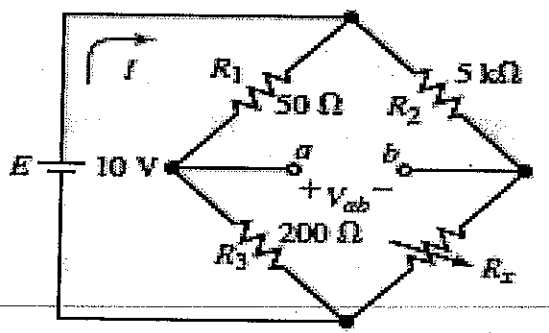

Figure 1

b) For the arrangement shown in Figure 2 find:
i) the equivalent capacitance of the circuit and
ii) the voltage across a 4.5 μF capacitor.

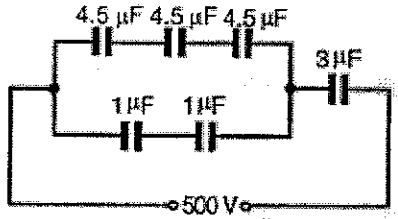

Figure 2

OR

3.a) Find the value of R_L for maximum power transfer in the circuit shown in Figure 3. Find the maximum power.

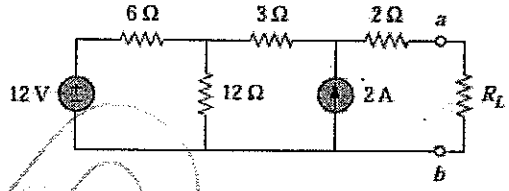

Figure 3

b) State and explain thevenin's theorem with an example.

4.a) Calculate:
i) The admittance Y
ii) The conductance G and
iii) Susceptance B of a circuit consisting of a resistor of 10 Ω in series with an inductor of 0.3 H, when the frequency is 50 Hz.

b) A resistance of 10 Ohms, an inductive reactance of 5 Ohms, and a capacitive reactance of 10 Ohms are connected in parallel with each other across a supply of 230 $\angle 45^0$ Volts. Calculate
i) Impedance and admittance of each branch
ii) Current in each branch
iii) Total current drawn from the supply
iv) Draw the phasor diagram.

OR

5.a) A 20 Ω resistance and 30 mH inductance are connected in series and the circuit is fed from a 220 V, 50 Hz AC supply. Find
i) Reactance across the inductance, impedance, admittance, current
ii) Voltage across the resistance
iii) Voltage across the inductance
iv) Real, reactive and active powers
v) Power factor

b) The waveform shown in Figure 4 is a half-wave rectified sine wave. Find the rms value and the amount of average power dissipated in a 10 Ω resistor.

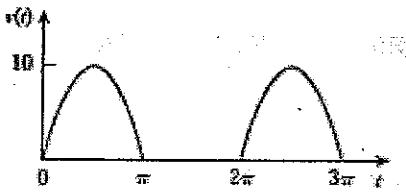

Figure 4

6.a) Explain the working principle of single phase transformer.

b) A 5 KVA single-phase transformer has a turns ratio of 10:1 and is fed from a 2.5 kV supply. Neglecting losses, determine:
i) the full-load secondary current
ii) the minimum load resistance which can be connected across the secondary winding to give full load KVA
iii) the primary current at full load KVA.

OR

7.a) Enumerate the various losses in a transformer. How can these losses be minimized?

b) A 2400 V/400 V single-phase transformer takes a no load current of 0.5 A and the core loss is 400 W. Determine the values of the magnetizing and core loss components of the no load current. Draw to scale the no-load phasor diagram for the transformer.

8.a) Based on the type of excitation classify the DC generators.

b) A 4-pole armature of a d.c. machine has 1000 conductors and a flux per pole of 20 mWb. Determine the e.m.f. generated when running at 600 rev/min when the armature is:
i) wave-wound
ii) lap-wound.

OR

9.a) Explain the working principle of three phase induction motor.

b) A 3-phase, 60 Hz induction motor has 2 poles. If the slip is 2% at a certain load, determine:
i) the synchronous speed
ii) the speed of the rotor and
iii) the frequency of the induced e.m.f.'s in the rotor.

10. With the help of a neat sketch explain the construction and operation of PMMC instrument.

OR

11.a) Discuss the classification of electrical instruments.

b) Explain the significance of controlling torque and damping torque relevant to the operation of indicating instrument.

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