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SE-6241

B. E. II (Sem. - III) (Information Technology) Examination

April/May – 2011

Elements of Electrical Engineering

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 2 (Sem. - 3) (Information Technology)**

Name of the Subject :

☛ **Elements of Electrical Engineering**

☛ Subject Code No. : **6 2 4 1** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer to the two sections must be written in separate answer books.
(3) Figures on right hand side indicate full marks.
(4) Assume suitable data wherever necessary
(5) Attempt all questions.

SECTION - I

1 (a) Answer the followings :

(i) Explain Kirchoff's voltage law. **2**

(ii) Explain superposition theorem. **2**

(iii) Distinguish between dependent and independent voltage sources. **2**

(b) Find R_{AB} for the network shown in figure 1 **4**

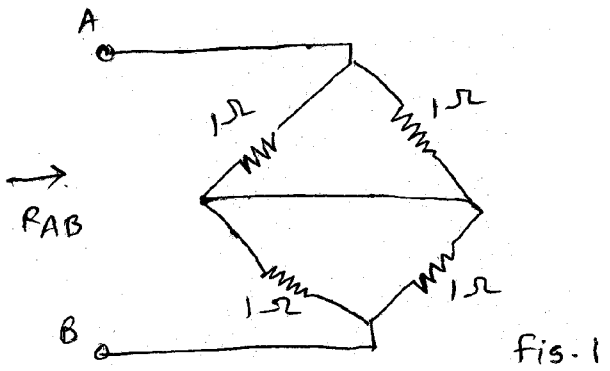

fig. 1

(c) In figure 2, steady state condition is reached with 100 V dc source At t = 0, switch k is suddenly opened. Find the expression of current through the inductor. Also find current through inductor at t = 0.5 second. **10**

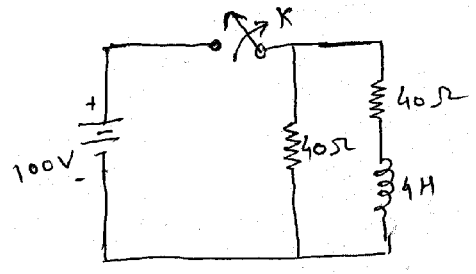

Figure 2

2 (a) State and explain Norton's thorem. **6**

(b) Using Norton's theorem, obtain the current through 10Ω resistance for the network shown in figure 3. **9**

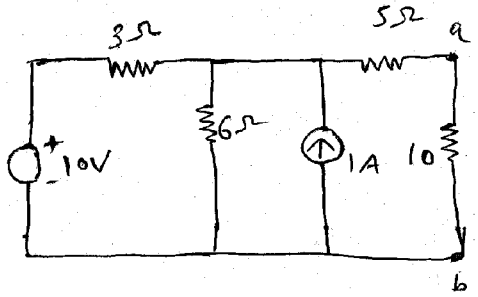

Figure 3

OR

2 (a) Explain the maximum power transfer theorem. **6**

(b) Using maximum power transfer theorem, find the value R_L such that maximum power can be transferred to it, for the network shown in figure 4. **9**

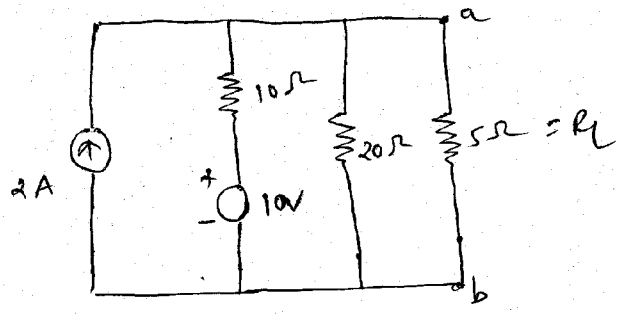

figure 4

3 (a) Attempt any **three** : **15**

(i) Using Nodal analysis find the voltage V_1 and V_2 for the circuit shown in figure 5.

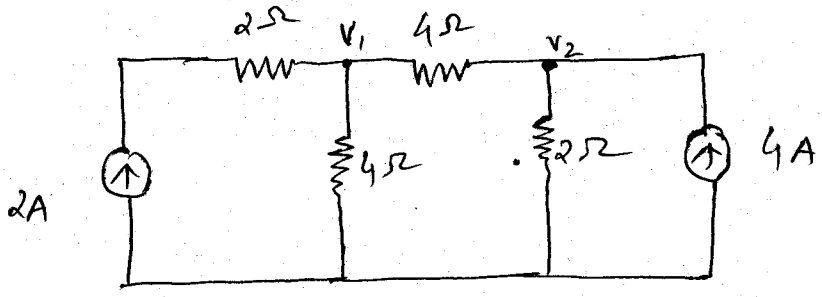

Figure 5

(ii) Obtain the Laplace transform

(i) f(t) = t

(ii) $f(t) = e^{-t}$

(iii) State and prove initial value theorem.

(iv) Find the inverse Laplace of below given function.

$$F(s) = \frac{1}{s+a}$$

(v) Find current I by Thevenin's theorem in network shown in figure 6.

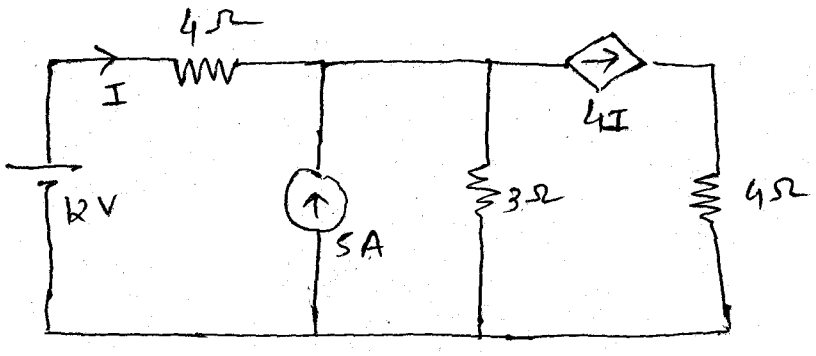

Figure 6

SECTION - II

4 (a) Fill in the blanks : **10**

(i) _____ method gives speed of dc shunt machine below base speed.

(ii) Wave winding is suitable for _____ current but _____ voltage machines.

(iii) An ideal dc generator has regulations of _____ percent.

(iv) DC _____ motors are best suited for electric traction.

(v) The phase relation between primary and secondary voltages of power transformer is _____.

(vi) The _____ loss remains constant independent of load for a transformer.

(vii) An 80 MVA, 400 Hz transformer is operated at 50 Hz its MVA rating is _____.

(viii) The actual speed of induction motor is always _____ than the synchronous speed.

(ix) In the circle diagram of induction motor the diameter of the circle represents the_____.

(x) In double cage induction motor the inner cage has _____ resistance and _____ leakage reactance.

(b) Draw the circle diagram from no-load and short circuit test of a 3 phase, 15 kW, 415 V, 4-Pole, 50 Hz induction motor from the following test results : **10**

No load : 415 V, 10.5 A, 1510 W

Short circuit : 105 V, 28 A, 2040 W

Stator and rotor Cu losses are equal at standstill.

From the diagram, find : (a) line current, slip, efficiency and p.f. at full load (b) the maximum torque.

5 (a) Draw a vector diagram with appropriate notations of transformer having following types of different loads : **7**

(i) Purely resistive load

(ii) Lagging power factor load

(iii) Leading power factor load

(b) A 250 V, 4 pole, dc shunt motor has armature resistance of 0.12Ω and field resistance of 125Ω. It has 960 lap connected conductors and a flux of 20 mWb per pole. If the input current is 30 A, estimate : **8**

(i) Speed and torque developed.

(ii) % efficiency, if constant losses are 10% of output power of the motor.

OR

5 (a) What is armature reaction ? What are the effects of armature reaction ? How the armature reaction is minimized ? 7

(b) A 12 kVA, 220/440 V, 50 Hz single phase trsnsformer gave the following test results : 8

OC test (LV side) : 220 V, 2 A, 165 W

SC test (HV side) : 12 V, 15 A, 60 W

Obtain the equivalent circuit as referred to LV Side.

6 Attempt any **three** : 15

(a) Explain the various types of dc generators.

(b) Define voltage regulation of transformer. And derive its approximate expression.

(c) A 500 kVA, 1-phase transformer has an iron loss of 500 W and full load copper loss of 600 W. Calculate the efficiency at 75% full load and 0.8 power factor lagging. Also calculate maximum efficiency at that power factor.

(d) In a d.c. generator fluxes are directly propoertional to 1.2 times field current. The generator working at a speed of 200 r.p.m. and flux per pole is 30 mWb. If the generator is lap wounded with 600 conductors in series, find the e.m.f. generated. If the winding is wave wound, find the change in excitation current to obtain the same voltage as above. Number of pole in machine are 6.

(e) The power input to a 3- phase induction motor is 50 kW and the corresponding stator losses are 2 kW. Calculate :

(a) The gross mechanical power developed and rotor copper loss if the slip is 5%.

(b) The net power output of the motor if the frictional and windage losses are 3 kW.

(c) Efficiency of the motor.
