No. of Printed Pages : 5

ET-202(B)

00154

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2010

ET-202(B) : PRINCIPLES OF ELECTRICAL SCIENCES

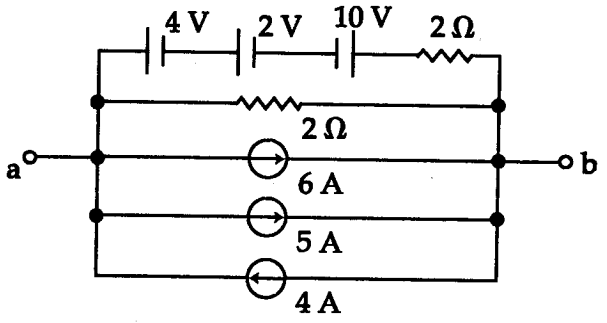
Time : 3 hours *Maximum Marks : 70*

Note : *Answer any five questions in all. Use of calculator is permissible.*

1. (a) Define resistance, inductance and capacitance. Give their units, v-i relationship values and specifications for a resistor with uniform geometry an inductor with a toroidal core and a parallel plate capacitor respectively. 6

(b) State and explain Thevenin's theorem. What is the thevenin equivalent of an ideal d.c. source ? 2

(c) When are two 2-terminal networks said to be equivalent ? What is the significance of equivalent circuits ? Find simple equivalent for the 2-terminal network shown below : 6



2. (a) Explain the following with reference to a 3 phase system : 6

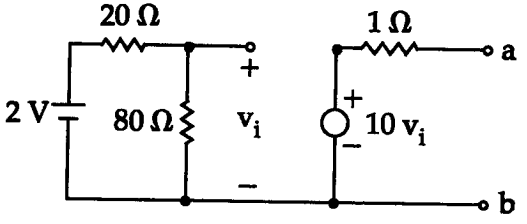
(i) Meaning of phase sequence,

(ii) Function of the neutral wise in the supply system and

(iii) Distinction between phase and line voltages.

(b) What do you understand by the characteristic equation of a system ? What information does it provide regarding the behaviour of the system ? How is it related to the system function ? 4

(c) Find the Thevenin equivalent at terminals 'a' and 'b' of the active network shown below. 4



3. (a) Give the advantages of three phase system relative to single phase systems. Explain briefly why small electrical loads are designed and built for single phase operation ? 4

(b) A d.c. machine generates an armature voltage of 220 V on no load at 1000 rpm,the field current being 2A. the armature resistance is 0.5 Ω. Find its speed when it draws a current of 5A as motor from the 220 V supply. (Neglect armature reaction and brush voltage drop) 4

(c) What is the effect of renessing polarity of the supply voltage on the direction a rotation in the case of the shunt, series and compound d.c. motors ? comment. 6

4. (a) Sketch the typical torque-speed curve of a 3 phase induction motor and identify these on the region of normal operation of the motor. Neglecting stator resistance and stator leakage reactance, show that the maximum torque occurs at a slip of (R_2 / X_2), where R_2 and X_2 have their usual meanings. 6

(b) A 3- phase star connected alternator is rated for 5000kVA, 5kV, 50Hz, 150 rpm. It has negligible armature resistance and synchronous reactance of Xs=1.50 ohm. Find the induced emf and torque angle when the machine is supplying full load 4

(c) The following voltages are simultaneously fed to the X-and Y- plates of a CRO 4

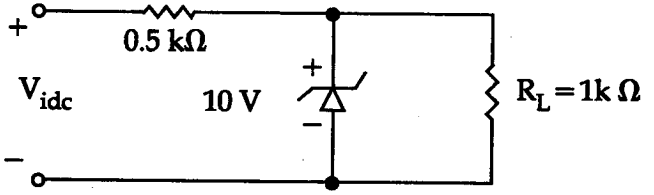
$V_y = 10 \sin 314\,t \quad V_x = -\sin 314\,t$

The X and Y deflection sensitivities are 2.5V/cm and 5 V /cm respectively. Sketch the figure that would be observed on the screen of the CRO.

5. (a) A 400 V, 3-phase induction motor runs on no load, drawing a current of 4A from the mains. If the power factor of operation is 0.3 what are the readings of the two wattmeters connected for power measurement ? 4

(b) Draw the complete circuit of a bipolar junction transistor (BJT) differential amplifier. 4

(c) A Zener regulator shown below employs a 10V zener diode with a maximum permissible power dissipation of 50 mW and a knee current of 0.1 mA. Estimate the minimum and maximum permissible limits of the input dc voltage Vidc for obtaining regulated voltage. 6



6. (a) Give the circuit diagrams and associated waveforms of a compasator,astable multivibrator and function generator using operational amplifiers. 6

(b) Draw the circuit of wein bridge oscillator and express the frequency of oscillation in terms of the circuit parameters. 4

(c) Sketch a 4-bit parallel -m, serial out, shift right register with an initial content of 1001. By means of waveforms and a content table explain its operation through five clock cycles. 4

7. (a) For an 8085 microprocessor. 6

(i) What does the signal IO/ $\overline{M}$ signify and how is it normally used ?

(ii) What is the function of stack pointer ?

(b) What is meant by an interrupt in a microprocessor ? List all the interrupts that are available in 8085 microprocessor. 6

(c) What is analog output voltage of a D-to-A converter corresponding to an input 1101 and V_r=4V ? 2