

Seat  
No.

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मधुर - 003

## Electrical Circuits and Machines (143102/183102/233102)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub - questions from each unit.
5. Assume suitable data wherever necessary & state the assumptions made.
6. Diagrams / sketches should be given wherever necessary.
7. Use of logarithmic table, drawing instruments & non - programmable calculators permitted.
8. Figures to the right indicate full marks.

### UNIT - I

1. a) i) Find the Thevenins equi. of the ckt Shown below fig (a) & determine the value of c/n flows through load impedance of  $(6+j30)\Omega$  connected across terminals M & N Also calculate the power dissipated in load impedance.

4

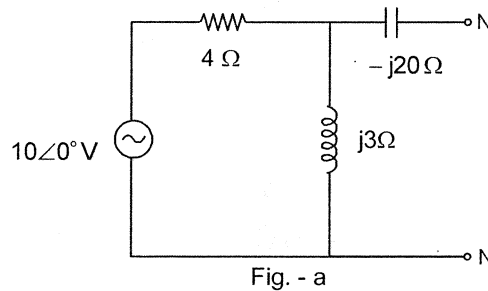


Fig. - a

- ii) Find the Norton's equi. - n/w of terminals AB of the ckt - Shown below fig (b).

4

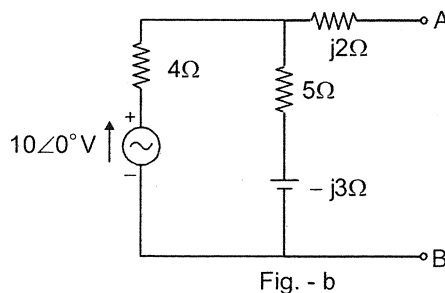


Fig. - b

- b) i) Define the relationship between line c/n & phase c/n for delta connected three phase balanced load. 4
- ii) A 400 V, 3  $\phi$  star connected induction motor draws a line c/n of 20A & an i/p power of 12 kw. The phase sequence is R-Y-B. A wattmeter has its c/n coil in line Y & its pressure coil connected across BR line. Sketch the connection diagram, Phasor diagram & find the reading on the wattmeter. 4
- c) Derive an expression for total power consumed by three phase balanced star connected inductive load using two wattmeter method. Draw neat ckt & phasor diagram. 8

## UNIT - II

2. a) Explain why starter is necessary for a DC motor. Explain with neat diagram the working of a three point starter. 8
- b) i) Derive the torque eq<sup>n</sup> of a dc motor. 4
- ii) Draw & explain following ch<sup>rs</sup> of DC series motor. 4
- a)  $T_a - I_a$  b)  $N - I_a$
- c) N -  $T_a$ .
- c) i) A shunt generator delivers 195 Amp. at a terminal voltage of 250 volt  
 $R_a = 0.02 \Omega$  &  $R_{sh} = 50 \Omega$  find
- i) Generated emf ii)  $Cu$  - losses
- iii) O/P of prime mover iv) Electrical efficiency
- Given the iron & friction losses are 950 watt. 4
- ii) A 6 pole, 500V wave connected shunt motor has 1200 armature conductors & useful flux per pole 20 mwb. The armature and field resistance are  $0.5 \Omega$  and  $250 \Omega$  resply. What will be the speed & torque developed by the motor when it draws 20 A from the supply mains ? Neglect armature reaction. If magnetic & mechanical losses amount to 900w. Find 4
- i) Useful torque ii) O/P in kw
- iii) Efficiency at this load.

### UNIT - III

3. a) Draw open circuit & short circuit Test of 1 $\phi$  Transformer & explain the steps to find out equivalent parameters.

- b) i) Explain the working principle of transformer. 4
- ii) Draw the phasor diagram for transformer on load at unity and lagging P. F. load. 4
- c) Write a short notes on. 8
- i) Autotransformer.
- ii) Current transformer.

#### UNIT - IV

4. a) Derive an expression of emf equation of an alternator. 8
- b) i) Explain the principle of operation of an alternator. 4
- ii) What are the different methods of starting synchronous motors & explain any one in detail. 4
- c) i) Explain with phasor diagram the effect of varying the excitation on the performance of a synchronous motor or load with constant excitation. 4
- ii) Write a short note on Hunting in synchronous motors ? 4

#### UNIT - V

5. a) Explain working principle of three phase induction motor & the concept of rotating magnetic field ? 8
- b) i) Draw & explain the torque - slip characteristics of 3 phase induction motor. 4
- ii) Write a short note on Autotransformer starter. 4
- c) i) With the help of neat sketch, Explain the working & applications of capacitor start single phase induction motor. 4
- ii) With the help of neat sketch, Explain the working & applications of universal motor. 4

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