



Electrical Circuits and Machines (143102 / 183102 / 233102)

P. Pages : 3

Time : Three Hours

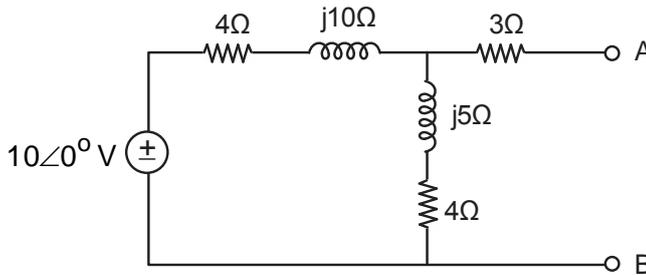
Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet 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.
6. Neat diagrams must be drawn wherever necessary.
7. Use of non-programmable electronic calculator is allowed.
8. Figures to the right indicate full marks.

UNIT – I

1. a) Obtain Thevenin's and Norton's equivalent circuits for the network shown. **8**



- b) With the help of neat circuit and phasor diagram, show that active power in 3- ϕ , star connected balanced – inductive load can be measured by "one Wattmeter Method " **8**
- c) A star connected 3- ϕ load has an impedance per phase-consisting of 8 Ω resistance in series with an – inductive reactance of 10 Ω . It is fed from 400 volt, 3- ϕ balanced supply find : **8**
- i) Line current
 - ii) Active power
 - iii) Reactive power
 - iv) Apparent power, Draw circuit and phasor diagram.

UNIT – II

2. a) The following data refers to a D. C. shunt generator : 8
 $R_a = 0.04\Omega$, $R_{sh} = 45\Omega$, contact drop / brush = 1 volt, iron losses = 2.5 kw,
 Mechanical losses = 1 kW, find the efficiency of the generator when it
 delivers 400 Amp at 440 volt.
- b) Explain working principle of D.C Motor. Derive the armature torque equation
 and speed equation in D.C. Motor ? 8
- c) i) Draw and explain following characteristics for D.C. shunt motor : 4
 (i) $T_a - I_a$ (ii) $N - I_a$ (iii) $N - T_a$
- ii) Explain with neat diagram the working of three point starter. 4

UNIT – III

3. a) Compare core type and shell type construction of single phase transformer. 8
 Also derive EMF equation of 1- ϕ , Transformer.
- b) Develop step-by-step, the equivalent circuit of 1- ϕ , Transformer. Also draw 8
 phasor diagram of 1- ϕ transformer at lagging P.F. and load condition.
- c) Draw open circuit and short circuit tests of single phase-transformer and 8
 explain the need of these test. Why efficiency of transformer is higher as
 compared to the Rotating machines.

UNIT – IV

4. a) With the help of neat diagram, describe constructional features of alternator 8
 and principle of it's operation.
- b) Derive from first principle the EMF equation of synchronous generator. Also 8
 define coil span factor & distribution factor.
- c) Write short note on : 8
 i) Hunting in synchronous motor.
 ii) Method of starting synchronous motor.

UNIT – V

5. a) What is need of starter for 3- ϕ induction motor ? Draw & explain star – delta and autotransformer starter used for 3- ϕ I. M. **8**
- b) Derive Torque Equation of 3- ϕ Induction motor under running condition and explain Torque – Slip characteristics. Also state the application of 3- ϕ I. M. **8**
- c) Write short note on: **8**
- i) Servo – motors
- ii) Capacitor split – phase 1- ϕ induction motor.
