

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question No 1 is compulsory.
  2. Attempt any THREE questions from remaining
  3. Figures to right indicate full marks.

- Q. 1** Attempt **any Four** questions.
- a) How the back emf ( $E_b$ ) makes the DC motor a self regulating machine. (05)
  - b) Explain the electro-mechanical energy conversion. (05)
  - c) Briefly explain the Swinburne's test for DC machine. (05)
  - d) Explain the conditions for parallel operation of single phase transformer. (05)
  - e) Why the terminal voltage of DC shunt generator falls when it is loaded. (05)
- Q. 2**
- A) Explain the concept of singly excited machines and derive the expression for the electromagnetic torque. (10)
  - B) Derive the expression of copper saving in Auto-Transformer. (10)
- Q. 3**
- A) Derive the expressions for Demagnetizing Amp-turns ( $AT_d/\text{pole}$ ) and cross magnetizing Amp-turns ( $AT_c/\text{poles}$ ) for armature reaction. (10)
  - B) Two identical dc shunt machine, when tested for Hopkinson's test, gave the following readings. (10)
- Line voltage = 230V  
 Line current (excluding field currents) = 30A  
 Motor Armature current = 230A  
 Field currents 5A and 4A.  
 If the armature resistance of each machine =  $0.025 \Omega$ , calculate the efficiency of each machine.
- Q. 4**
- A) Explain the Sumpner's test for single phase transformer. (10)
  - B) Two single phase transformers shared a load of 400 KVA at 0.8 p.f. lagging. Their equivalent impedances referred to secondary windings are  $(1 + j2.5)$  and  $(1.5 + j3)$  ohms respectively. (10)
- Calculate the load shared by each transformer.
- Q. 5**
- A) Explain the necessity of starter and hence explain the working of three point starter. (10)
  - B) A 7.46 kw, 220v, 900 rpm shunt motor has full load efficiency of 88% and armature resistance of  $0.08 \Omega$ , while shunt filed current of 2A. (10)
- If the speed of this motor is reduced to 450 rpm by inserting a resistance in armature circuit. The load torque remains constant, find the motor output efficiency and the extra resistance inserted in armature circuit.
- Q. 6** Write short note on each (20)
- A) Electrical braking in separately excited DC motor.
  - B) Commutation process in DC Generator.

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