Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5252]-547

S.E. (Electrical Engineering) (Second Semester)

EXAMINATION, 2017

ELECTRICAL MACHINES-I

(Thoery)

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. **:—** (*i*) Answer Q. No. 1 *or* Q. No. 2, Q. No. 3 *or* Q. No. 4, Q. No. 5 *or* Q. No. 6, Q. No. 7 *or* Q. No. 8.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of algorithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

1. (*a*) Develop equivalent circuit of single phase transformer referred to secondary side. State clearly the assumptions made. [7]

(*b*) State the necessity of parallel operation of transformer. State any *four* necessary conditions for satisfactory parallel operation of transformer. [6]

P.T.O.

Or

2. (*a*) Two single phase transformer with equal turns have impedances of (0.5 + *j*3) ohm and (0.6 + *j*10) ohm with respect to secondary. These transformers are connected in parallel. Find the kVA and kW shared by each transformer if the total load of 100 kW at power factor 0.8 lagging is connected to them. [7]

(*b*) Define voltage regulation of a transformer. Describe the effect of power factor on voltage regulation of transformer. [6]

3. (*a*) A 500 volt DC shunt motor has armature resistance of 1.2 ohm and field resistance of 500 ohm respectively on no-load it runs at 1000 rpm drawing current of 4 Amp from supply. Find the speed if motor is loaded and takes a current of 26 Amp.

Also find speed when resistance of 2.3 ohm is connected in series with armature. The current taken by motor at this condition is 26 Amp. [6]

(*b*) In case of DC machine, state the material used and function of the following parts : [6]

(*i*) Commutator

(*ii*) Yoke

(*iii*) Brush.

Or

4. (*a*) Derive the torque equation of DC motor by usual notation. State clearly the meaning of each term used in the derivation. [6]

(*b*) Draw and explain the following characteristics of DC shunt motor : [6]

(*i*) Torque-armature current

(*ii*) Speed-armature current.

5. (*a*) Draw a neat sketch of star-delta starter used for 3-phase squirrel cage induction motor. Explain its working. [6]

(*b*) The power input to a 3-phase, 6 pole, 50 Hz induction motor is 47 kW at certain load. The stator losses are 1.5 kW and mechanical losses are 1 kW respectively. Find the output power of motor in HP if it runs at 970 rpm. [7]

Or

6. (*a*) State the similarities and differences between 3-phase induction motor and transformer (3 each). [6]

(*b*) Derive the expression for the following ratio $\frac{\text{Full load torque}}{\text{Maximum torque}}$ for a 3-phase induction motor. [7]

7. (*a*) State the effect of addition of rotor resistance on torque-slip characteristics of 3-phase induction motor. Draw the torque-slip characteristics for different values of rotor resistance and explain it in brief. [6]

(*b*) Explain no-load test on 3-phase induction motor with a suitable diagram. Also elaborate how magnetising circuit parameters are obtained from no-load test. [6]

Or

8. (*a*) A 3-phase induction motor with star connected rotor has stand-still induced emf between sliprings = 173.2 volt. The standstill rotor impedance per phase is (0.2 + *j*1.5) ohm. Find the rotor current :

(*i*) At start, when started with external resistance adjusted to obtain maximum torque at start.

(*ii*) When running at slip of 5% with sliprings short circuited. [6]

(*b*) Compare the following starters used for 3-phase induction motor.

Star-delta starter, Autotransformer strater (Minimum **3** points of comparison expected). [6]