Total No. of Questions—**8**] [Total No. of Printed Pages—**4+1**

Seat No.	

S.E. (Electrical) (Second Semester)

EXAMINATION, 2014

ELECTRICAL MACHINES I

(2012 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** and 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 non-programmable calculator is allowed.

(*v*) Assume suitable data if necessary.

1. (*a*) Obtain the approximate equivalent circuit of a single-phase transformer referred to primary side. Show all the parameters on it. [6]

P.T.O.

(*b*) Define parallel operation of transformer. Explain necessity of parallel operation of transformers. [6]

Or

2. (*a*) A 100 KVA, 50 Hz, 440/11000 V, 1-phase transformer has an efficiency of 98.5% when supplying full load current at 0.8 p.f. lagging and an efficiency of 99% when supplying half full load current at unity power factor. Find the copper losses and core losses corresponding to full load current. At what value of full load current maximum efficiency be obtained ? [6]

(*b*) With a neat diagram, explain Scott connection of transformer. [6]

3. (*a*) Derive the torque equation of a DC motor. [4]

(*b*) Draw and explain the torque armature current characteristics of DC shunt and DC series motor. [4]

(*c*) Explain *two* methods of speed control of DC series motor. [4]

Or

4. (*a*) Sketch 4-point starter and explain function of :

(*i*) NVC

(*ii*) overload coil. [6]

(*b*) A 220 V DC series motor is running at a speed of 800 rpm and draws 100A. Calculate at what speed motor will run when developing half the torque. The total resistance of armature and field is 0.1 ohm. Assume magnetic circuit to be unsaturated. [6]

5. (*a*) Prove that a rotating mmf is produced when 3-phase currents are fed to a symmetrical three-phase distributed winding. Use analytical method for the answer. [6]

(*b*) A 3-phase induction motor has a 4-pole, star connected stator winding. The motor runs on a 50 Hz supply with 200 V between the lines. The rotor resistance and standstill rotor reactance per phase are 0.1 ohm and 0.9 ohm respectively. The ratio of rotor to stator turns is 0.67.

Calculate :

(*i*) Torque at 4% slip

(*ii*) Maximum torque

(*iii*) Speed at maximum torque

(*iv*) Maximum mechanical power.

Neglect stator impedance. [7]

Or

6. (*a*) Sketch and explain the torque slip characteristics of a 3-phase induction motor. Show the starting torque, pull out torque, maximum torque at starting and full load operating region [6]

(*b*) Derive relationship between rotor input, rotor copper loss and gross mechanical power developed. [7]

7. (*a*) Sketch and explain approximate equivalent circuit of a 3-phase induction motor. [7]

(*b*) What is necessity of starter in a 3-phase induction motor ? Explain functioning of a star-delta starter with a neat sketch. [6]

Or

8. (*a*) With a neat connection diagram, explain the no load and blocked rotor tests performed on an 3-phase induction motor. Also state the parameters found by using these tests. [7]

(*b*) A cage rotor 3-phase induction motor when started by means of a star delta starter takes 180% of full load line current and develops 35% of full load torque at starting. Calculate the starting torque and current in terms of full load values, if an autotransformer with 75% tapping were employed. [6]