



[4658] – 542

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| Seat No. |  |
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**T.E. (Electrical) (Semester – I) Examination, 2014**  
**ELECTRICAL MACHINES – II**  
**(2012 Course)**

Time : 3 Hours

Max. Marks : 70

- Instructions :** 1) **Neat** diagrams must be drawn **wherever** necessary.  
2) **Black** figures to the **right** indicate **full** marks.  
3) **Use** of electronic pocket calculator is **allowed**.  
4) Assume **suitable** data, **if necessary**.  
5) Answer Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6**, Q. No. **7** or **8**, Q. No. **9** or **10**.

1. a) A 3 phase 4160 V, 3.5 MVA, 50 Hz star connected alternator has open circuit characteristics given by following data :

|           |      |      |      |      |      |      |      |      |
|-----------|------|------|------|------|------|------|------|------|
| $I_f$ (A) | 50   | 100  | 150  | 200  | 250  | 300  | 350  | 400  |
| $V_L$ (V) | 1620 | 3150 | 4160 | 4750 | 5130 | 5370 | 5550 | 5650 |

A field current of 200A is found necessary to circulate full load current on short circuit of alternator. Using MMF method, calculate voltage regulation at 0.8 pf lag. Neglect armature resistance.

8

- b) What is meant by short circuit Ratio in case of alternator ?

2

OR

2. a) With neat diagram describe the slip test. How  $X_d$  and  $X_q$  can be determined ?

6

- b) Explain :

- 1) Coil span factor  
2) Distribution factor

4

3. a) Define voltage regulation of alternator. If the alternator is loaded using resistive load, weather its terminal voltage will increase or decrease ? Why ?

6

- b) Write a short note on 'synchroscope'.

4

OR

4. a) A 400 V, 7.46 KW 3 phase synchronous motor has negligible armature resistance and has synchronous reactance of  $10\Omega$ /phase. Determine the minimum armature current and compounding induced emt for full load conditions. Assume efficiency at full load = 85%.

6

- b) Compare 3 phase synchronous motor with 3 phase induction motor (any 8 points).

4

P.T.O.



5. a) Explain following speed control methods of 3 phase induction motor  
 1) Cascade control method  
 2) V/f control method. 8
- b) Describe with neat diagram, construction and working of permanent magnet stepper motor. 8
- OR
6. a) Explain the operation of 3 phase induction motor as Induction Generator. State its advantages and applications. 8
- b) Explain the construction and working of Linear Induction Motor state its applications. 8
7. a) What are the types of compensated a.c. series motor ? Describe each with diagram. 8
- b) A universal motor has resistance of  $30\ \Omega$  and inductance of  $0.5\ \text{H}$ . When connected to  $250\ \text{V}$  d.c. supply and loaded to take  $0.8\ \text{A}$ , it runs at  $2000\ \text{rpm}$ . Determine the speed, torque and power factor when connected to  $250\ \text{V}$ ,  $50\ \text{Hz}$  ac supply and loaded to take same current. 8
- OR
8. a) Explain the procedure to plot circle diagram of a.c. series motor. How full load efficiency torque scale and speed scale can be determined ? 10
- b) Explain modifications necessary in the construction of d.c. series motor to operate it satisfactorily on a.c. supply. 6
9. a) With neat diagram explain the construction and working of 1 phase capacitor start induction motor. State its applications. 8
- b) A  $230\ \text{V}$ ,  $800\ \text{W}$  2 pole  $50\ \text{Hz}$  1 ph I.M. have following parameters  $\rightarrow R_1 = 2.2\ \Omega$ ,  $X_1 = 3\ \Omega$ ,  $R_2' = 3.8\ \Omega$ ,  $X_2' = 2.1\ \Omega$ ,  $X_m = 86\ \Omega$ .
- Calculate current, power factor and efficiency when operating at slip of  $6\%$  draw equivalent circuit and show all the terms in it. 10
- OR
10. a) With neat diagram, explain double revolving field theory. Hence draw torque-speed characteristics of single phase induction motor. 8
- b) With neat diagram, explain construction and working of shaded pole induction motor. Draw its torque-speed characteristics. State applications of this motor. 10