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[4757]-137**S.E. (Electrical) (Second Semester)****EXAMINATION, 2015****ELECTRICAL MACHINES—I****(2008 Pattern)****Time : Three Hours****Maximum Marks : 100**

N.B. :— (i) Answer *three* questions from Section I and *three* questions from Section II.

(ii) Answers to the two sections should be written in separate answer-books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.

(vi) Assume suitable data, if necessary.

Section I

1. (a) Obtain the condition of maximum efficiency of transformer and thereby the output current. [8]
- (b) What is autotransformer ? Compare autotransformer with two-winding transformer for the same rating. [8]

P.T.O.

Or

2. (a) With neat connection diagram, explain OC and SC test on 1-ph transformer to obtain efficiency and voltage regulation. [8]
- (b) A 500 kVA, 1-ph transformer has an efficiency of 93% both at full load and half load and p.f. unity. Determine efficiency at 75% of full load and pf = 0.8 lagging. [8]
3. (a) What is the necessity of parallel operation of transformers. State and explain the conditions to be satisfied for parallel operation of 1-ph transformers. [8]
- (b) Write short note on tertiary winding of transformer. [8]

Or

4. (a) What is V-V connection ? Explain with neat connection diagram. [8]
- (b) What are the standard connections used for 3-ph transformers ? Explain each and state their applications. [8]
5. (a) Draw the construction diagram of D.C. machine, label it and explain each part. [10]
- (b) 220 V, 4P, d.c. shunt motor has 540 Lap wound armature conductors. It draws a current of 35 A and develops 6 kW. The armature and field winding resistances are 1 Ω and 220 Ω respectively. The flux/pole is 30 mWb. Calculate : [8]
- (i) Developed torque (T_d)
- (ii) Shaft torque (T_{sh})

Or

6. (a) Obtain the torque equation of DC motor. [6]
- (b) Draw the power flow diagram of D.C. motor and explain. [6]
- (c) Compare Lap winding and Wave winding. [6]

Section II

7. (a) Sketch and explain torque-I_a characteristics for d.c. shunt and series motor. [8]
- (b) What is the necessity of starter for D.C. motor ? Draw the diagram for 3-point starter and explain. [8]

Or

8. (a) Explain the various methods used for speed control of D.C. series motor. [8]
- (b) What is commutation ? What are the causes of bad commutation ? Suggest the suitable remedial measures. [8]
9. (a) Explain, how the rotating magnetic field is produced, when 3-ph supply is fed to 3-ph symmetrical winding of induction motor. [8]
- (b) Obtain the relationship between : [8]
- (i) T_{st}/T_{max}
- (ii) T_{FL}/T_{max}

Or

10. (a) Sketch and explain, family of torque-slip curves of 3-ph induction motor. [8]
- (b) A 3-ph, 4 pole, 50 Hz induction motor consumes power of 40 kW while running at 1440 rpm. The stator and mechanical losses are 1.4 kW and 0.80 kW respectively. Calculate : [8]
- (i) rotor Cu loss
 - (ii) mechanical power developed
 - (iii) O/P power
 - (iv) Efficiency
11. (a) Explain various methods of speed control of 3-ph induction motor. [10]
- (b) What is the necessity of starter for 3-ph induction motor ? With suitable connection diagram, explain auto-transformer starter. [8]

Or

12. (a) Explain no load test and blocked rotor test to be performed on 3-ph induction motor for circle diagram. Draw the circle diagram and show full load current, torque line, output line, rotor Cu loss, stator loss, max. torque on it. [12]
- (b) Sketch and explain approximate and exact equivalent circuit of 3-ph induction motor. [6]