Code: 13A02404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December/January 2015/2016

ELECTRICAL MACHINES – II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Distribution transformers are always designed for lower magnetic losses. Why?

(b) For a load of same magnitude, the efficiency of a transformer will be more for 0.8 leading power factor load than 0.8 lagging power factor load. Comment.

(c) Give the factors affecting the load sharing among the transformers operating in parallel.

(d) Comment on the size, efficiency and voltage regulation of autotransformer and a two winding transformer.

(e) Why a bank of single phase transformers connected in delta is preferred over a three phase delta connected transformer?

(f) A 3-phase, 50 Hz squirrel cage induction motor runs at 4% slip. What will be frequency of rotor currents?

(g) What is Cogging in an induction motor?

(h) The starting current and starting torque of induction motor increases with decrease in supply frequency. How is the starting current and starting torque related to the supply frequency?

(i) In what ratio the line current and starting torques are reduced with star-delta starting?

(j) On what factors does the speed of a induction motor depend?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) With relevant phasor diagrams, explain the operation of a practical single phase transformer operating on lagging and leading power factor loads.

(b) A single phase 50 Hz transformer has 440 turns on the primary and 110 turns on the secondary winding takes a no-load current of 5 A at 0.2 power factor lagging. If the secondary supplies a current of 120 A at a power factor of 0.8 lagging. Estimate the current taken by the primary. Take secondary voltage as reference.

OR

3 (a) In a transformer, derive the condition for maximum efficiency and thus find the load current at which the efficiency is maximum.

(b) A 200 kVA 1-phase transformer is in operation continuously. For 8 hours in a day, the load is 160 kW at 0.8 pf. For 6 hours, the load is 80 kW at unity pf and for the remaining period of 24 hours it runs on no-load. Full-load copper losses are 3.02 kW and the iron losses are 1.6 kW. Find all-day efficiency.

UNIT – II

4 (a) Derive an expression for saving of copper when an autotransformer is used.

(b) Obtain the approximate equivalent circuit of a 200 / 2000 V single-phase 30 kVA transformer referred to 200 V side using the following test results:

OC Test:	200 V	6.2 A	360 W	on l.v. side
SC Test:	75 V	18 A	600 W	on h.v. side

OR

5 (a) Two transformers operating in parallel have different reactance to resistance ratios. Show that one transformer operates at a better power factor than the other.

(b) With a neat circuit diagram, describe back-to-back test conducted on two identical transformers.

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UNIT – III

6 Explain Scott connection with neat diagrams. With necessary phasor diagrams, prove that a three-phase system can be established from a two-phase system using T-T connection.

OR

7 (a) Explain with the help of suitable diagrams, how rotating magnetic field is produced in a 3-phase induction motor.

(b) Why the air-gap between stator core and rotor is made as small as possible?

UNIT – IV

8 (a) Establish a relation between full load torque and maximum torque of a three phase induction motor.

(b) A 6-pole, 3-phase, 50 Hz induction motor develops maximum torque of 300 N-m at a speed of 960 rpm. Determine the torque developed by the motor at 5% slip. The rotor resistance per phase is 0.6 ohm.

OR

9 (a) Describe the principle of operation of three phase induction motor. What are the operational similarities and differences between transformers and induction motors?

(b) The power input to the rotor of a 440 V, 50 Hz, 3-phase, 6-pole induction motor is 50 kW. It is observed that the rotor e.m.f makes 120 complete cycles per minute. Calculate: (i) Slip. (ii) Rotor speed. (iii) Rotor copper loss/phase. (iv) Rotor resistance per phase.

UNIT – V

10 (a) Explain the consequent pole technique for controlling speed of three phase induction motor.

(b) Explain the cascade arrangement for controlling the speed of three phase induction motor. Derive the equation for speeds at which the cascade set operates.

OR

11 (a) List out the merits and demerits of rotor resistance control over other methods of controlling the speed of three phase induction motor.

(b) With a neat sketch, explain the operation of star-delta starter. Also, mention its limitations.

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