Code: 13A02404

R13

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

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) What are the various losses in a transformer? And how do these losses vary.

(b) Define All day efficiency. How it is different from efficiency?

(c) Define efficiency and regulation of a transformer.

(d) List out different applications of autotransformer.

(e) Obtain the relation between V-V capacity and $\Delta - \Delta$ capacity.

(f) A slip ring induction motor runs at 290 rpm at full load, when connected to 50 Hz supply. Determine the number of poles and slip.

(g) A 400 V, 60 Hz, 6-pole, 3-phase induction motor runs at a speed of 1140 rpm when connected to a 440 V line. Calculate the speed if voltage increases to 550 V.

(h) Define synchronous watt and give its expression.

(i) List out different starting methods of induction motors.

(j) A cascaded set consists of two motors A and B with 4-poles respectively. The motor A is connected to a 50 Hz supply. Find the speed of the set and the electric power transferred to motor B when the input to motor A is 25 kW. Neglect losses.

PART – B

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

UNIT – I

2 (a) Explain the principle of operation of a single-phase transformer when it supplies lagging power factor load. Draw the phasor diagram under this condition.

(b) A 30 kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 ohm and a leakage reactance of 0.22 ohm. The low voltage winding resistance is 0.035 ohm and the leakage reactance is 0.012 ohms. Find the equivalent winding resistance, reactance and impedance referred to the (i) high voltage side (ii) low voltage side.

(OR)

3 (a) Derive an emf equation of a single phase transformer.

(b) The iron losses in a transformer core at normal flux density were measured at frequencies of 40 and 60 Hz and the results being 52 W and 90 W respectively. Calculate the hysteresis and eddy current losses at 50 Hz.

UNIT – II

4 (a) Explain how the equivalent circuit parameters can be obtained from open circuit and short circuit tests.

(b) In a 25 kVA, 2000/200 V transformer the iron and copper losses are 350 and 400 W respectively. Calculate the efficiency on UPF at (i) full load (ii) half load. (iii) Determine the load for maximum efficiency and the copper loss in this case.

(OR)

5 (a) What are the conditions required for the parallel operation of two transformers?

(b) A 300 kVA, 11000/440 V, single phase, 50 Hz transformer gave the following test results. Open circuit test on LV side a normal voltage and frequency, input 1300 W, 4amps; short circuit test HV side with voltage 600 V, input 2800 W, 150 amps. Calculate regulation for full load at 0.8 p.f lagging and what is the p.f on short circuit?

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UNIT – III

6 (a) Draw the diagrams of the following transformer connections.
(i) Scott connection. (ii) V – V. (iii) T – connection (3-phase to 3-phase).
(b) Explain the principle of 3-phase induction motor with the help of rotating magnetic field.

(OR)

7 (a) A 3-phase, 4-pole, 415 V, 50 Hz, delta connected induction motor running at a slip of 4%. The stator winding is delta connected with 240 conductors per phase and the rotor winding is star connected with 48 conductors per phase. The per phase rotor winding resistance is 0.013 ohms and a leakage reactance of 0.048 ohms at standstill. Calculate the following:
(i) The per phase rotor emf at standstill with the rotor open circuit.
(ii) The rotor emf and current at 4% slip.
(iii) The phase difference between the rotor emf and rotor current at 4% slip.
(b) Two transformers are required for a Scott connection operating from a 440 V, 3-phase supply for supplying two single phase furnaces at 200 V on the two phase side. If the total output is 150 kVA, calculate the secondary to primary turn ratio and the winding currents of each transformer.

UNIT – IV

8 (a) Derive the expression for torque in an induction motor.
(b) A 3-phase induction motor is driving full load torque which is independent of speed. If line voltage drops to 90% of the rated value, find the increase in motor copper losses.

(OR)

9 (a) Explain the no-load and blocked rotor tests on 3-phase induction motor.
(b) Discuss the phenomenon of crawling and cogging in an induction motor.

UNIT – V

10 (a) Explain the starting methods of wound rotor induction motor and its advantages.
(b) The rotor of a 3-phase IM has per phase rotor impedance of 0.04 + j 0.2. What external resistance must be added in external circuit to make the maximum torque at starting? How, this external resistance changes the current and power factor of the motor at starting?

(OR)

11 (a) Explain the autotransformer starter for 3-phase squirrel cage induction motor with neat sketch and obtain the expression for starting current and torque.
(b) A 400 V, 11.2 kW, 3-phase, 6-pole, full load efficiency of 88%, 0.85 p.f of delta connected induction motor runs at 960 rpm on full load. If it takes 86.4 A on direct starting, find the ratio of starting torque to full-load torque with a star-delta starter.

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