INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)
End Semester Examinations- June-July 2019
Semester – IV
B.Tech (Marine Engineering)
ELECTRICAL MACHINES II (UG11T3404)

Date: 01-07-2019 Maximum Marks: 100
Time: 3 Hrs Pass Marks: 50

Part – A

(Question 1 is Compulsory, 3x10 = 30 Marks)

Q1. a) Define slip in an induction motor. 3

b) Why is it not possible to run an induction motor on synchronous speed? 3

c) What are the different methods of speed control of induction motor? 3

d) What do you mean by the Crawling of induction motor? 3

e)A properly shunted centre-zero galvanometer is connected in the rotor circuit of a 6-pole, 50Hz induction motor. If the galvanometer makes 90 complete oscillations in one minute, calculate the rotor speed. 3

f) Explain hunting of alternators. 3

g) What will be the effect of increasing the load on alternators? 3

h) Define distribution factor in an alternator? 3

i) Why synchronous motor is not self-starting? 3

j)Why damper windings are used in a synchronous machine? 3

Part – B

(Answer any 5 questions from question nos. 2 to 8)

(5X14 =70 Marks)

Q2. a) Describe constructional features of 3-phase induction motor. 7 Marks

b) A 3-phase, 4- pole induction motor delivers 27.602 kW at the shaft at a speed of 1425 rpm on 500V, 50-Hz supply. The mechanical losses total 3 Hp and the power factor is 0.9. Calculate for this load (i) the slip (ii) the rotor copper loss (iii) the total power input if the stator losses are 2500W (iv) the efficiency (v) the line current (vi) the number of complete cycles per minute of the rotor emf. 7 Marks

Q3. a) Derive the relationship between the rotor copper losses, mechanical power developed and rotor input power in a 3-phase induction motor. 7 Marks

b) An induction motor has an efficiency of 85% when the load is 44.76 kW.

At this load, the stator copper loss and rotor copper loss are equal to the core-loss. The mechanical losses are one-fourth of the no-load loss. Calculate the slip. 7 Marks

Q4. a) Show that the maximum internal torque of 3-phase induction motor is independent on the rotor circuit resistance but maximum torque slip is depend on rotor circuit resistance. 7 Marks

b) The output of a 3-phase, 50 Hz, 4-pole induction motor is 7.46 kW at 1410 rpm. Calculate the starting torque if the maximum torque is developed at 1200 rpm. Neglect stator resistance and mechanical losses. 7 Marks

Q5. a) Draw a neat diagram showing the connections of 3-phase induction motor with star-delta starter. Explain how the above starter reduces the starting current. 7 Marks

b) Explain the double revolving field theory of 1-phase induction motor. 7 Marks

Q6. a) Show how a rotating magnetic field is produced having two poles for current distributions in the 3-phase winding in armature of a synchronous machine. 7 Marks

b) A 200 KVA, 480 V, 50 Hz, star- connected alternators with a rated field current of 5A was tested and the following data were-taken, (i) V_{Toc} at the rated I_F was measured to be 540 V. (ii) I_{Lsc} at the rated I_F was found to be 300 A. (iii) When a dc voltage of 10 V was applied to two of the armature winding terminals, a current 25 A was measured. Find the values of the armature resistance and the approximate synchronous reactance. 7 Marks

Q7. a) From the equivalent circuit of a 3-phase cylindrical rotor synchronous generator derive an expression for its power input, power output and voltage regulations. 7 Marks

b) A 40 kVA 440 V, 3-phase star-connected, 50 Hz, alternator has an effective armature resistance of 0.3 ohm per phase and leakage reactance of 0.6 ohm per phase. Determine (i) internal emf, (ii) no-load emf, (iii) percentage voltage regulation at full-load and (iv) value of armature reactance due to armature reaction at rated load and unity power factor. The synchronous reactance of the alternator is 3.3 ohm per phase. 7 Marks

Q8. a) Explain V-curves and inverted V-curves of synchronous motors. 7 Marks

b) Describe the comparison of synchronous and induction motors. 7 Marks

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