INDIAN MARITIME UNIVERSITY
(A Central University, Govt. of India)

B.Tech (Marine Engineering) - Semester IV
December 2015 End Semester Examinations

Electrical Machines– II
Sub Code: UG11T2404/UG11T1404

Time : 03.00Hrs | Max Marks: 100
Date : 19.12.2015 | Pass Marks: 50

Part A (10 x 3 = 30 Marks)

Compulsory Questions

1) (a) Explain why an induction machine is called a "Generalized transformer"? [3]

(b) Explain any one methods of speed control of the three phase induction motors? [3]

(c) Why an induction motor cannot run at synchronous speed? [3]

(d) Discuss the Crawling of induction motor. [3]

(e) What are the information needed to draw a circle diagram of 3-phase induction motor? [3]

(f) What are the different types of starters used for induction motor? [3]

(g) A 3-phase, 6-pole induction motor develops 4 kW at 950 rpm. What is the stator input if the stator loss is 220W? [3]

(h) Define the voltage regulation of an alternator. Is it possible to have the full-load terminal voltage greater than the no-load terminal voltage? Explain. [3]

(i) In an alternator, explain why short-circuit characteristic is a straight line whereas open-circuit characteristic is a curve. [3]

(j) Discuss the difference between alternator and synchronous motor. [3]

Part B ($5 \times 14 = 70$ **Marks)**
Answer Any Five of the following

2) (a) Draw the neat sketch of stator and rotor laminations of an Induction motor. State the functions of each part. [3 + 4 = 7]

(b) Show that in an induction motor, "Rotor input **:** power developed **:** rotor copper losses **::** 1 **:** (1-S) **:** S", where S is the fractional slip. [7]

3) (a) Write down the advantages of squirrel cage motor over a phase wound induction motor. Define "slip" of a 3-phase induction motor. [3 + 3 = 6]

(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 loses. [8]

4) (a) Draw a neat diagram showing the connections of 3-phase induction motor with star-delta starter. [6]

(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. [8]

5) A 400 V, 50 Hz, 6-pole star connected 3-phase induction motor is tested to yield the following results:

No-load test: 400 V, 20 A, 2080 watt (line values).

Block rotor tests: 133 V, 100 A, 8085 watt (line values).

The stator winding resistance per phase is 0.15 ohm. Determine the equivalent circuit parameters of the motor. [14]

6) (a) In a 3-phase synchronous generator, a lagging current has the effect of weakening the main field poles due to armature reaction but in synchronous motor, the effect of lagging current is to strengthen the main field poles. Explain with suitable diagram. [8]

(b) Derive an expression for emf generated per phase in 3-phase synchronous generator. [6]

7) (a) Derive an expression for winding distribution factor of a 3-phase Synchronous Generator. [6]

(b) A 3-phase, 4-pole, 60 kW, 50 Hz induction motor connected to rated supply voltage and running without load consumes 3 kW. When prevented from rotating it draws rated current at 30% rated supply and takes a power input of 4 kW. Assuming that under rated load conditions, the stator and rotor copper losses are equal and that the mechanical losses are 30% of the no-load losses, determine (i) slip at rated load and (ii) starting torque of the motor with rated applied voltage. [8]

8) (a) Discuss about the conditions necessary for paralleling of two three phase alternators. [7]

(b) 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]

9) (a) Explain briefly “hunting of synchronous machines. [7]

(b) A 3-phase, 50 Hz, 415 V, synchronous machine operates at rated voltage and at a leading pf of 0.9. Shaft power is 15 kW and the excitation emf is 400 V. If per-phase resistance is 0.5 ohm, find the synchronous reactance, neglect mechanical losses of the system. [7]

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