



INDIAN MARITIME UNIVERSITY

B.Tech (MARINE ENGINEERING)

June 2013 Examinations
FOURTH SEMESTER

ELECTRICAL MACHINES-II

Old Subject Code: UG/ME/BS/T/224
Date: 17.06.2013
Time: 3 Hrs

QP Code: T0511404
Max. Marks: 100

Part A

(10 × 3 = 30 Marks)

Answer all the Questions

1. (a) What is the function of capacitor in a single phase induction motor?
- (b) What is the function of slip ring in 3 – phase induction motor?
- (c) Write the causes of harmonics in the voltage and current waves of electrical machinery?
- (d) State two advantages of speed control of induction motor by injecting an e.m.f. in the rotor circuit.
- (e) In what ratio starting line current and starting torque is reduced with star – delta starting.
- (f) What are conditions for parallel operation of alternators?
- (g) Why field system of an alternator made as a rotor?
- (h) Define hunting with respect to 3 – phase synchronous motor.
- (i) List the inherent disadvantages of synchronous motor.
- (j) Define the term distribution factor.

Part B

(5 × 14 = 70 Marks)

Answer any five from the following

2. (a) Discuss the different power stages of an induction motor with losses (7)
- (b) An 18.65 KW, 4 – pole, 50 Hz, 3 – phase induction motor has a friction and windage losses of 2.5 % of the output. Full load slip is 4%. Find for full load (i) rotor copper loss (ii) rotor input (iii) shaft torque (iv) the gross electromagnetic torque. (7)

3. (a) A 3 – phase star connected 400 V, 50 Hz, 4 – pole induction motor has the following per phase parameters in ohms, referred to the stators $R_1 = 0.15 \Omega$, $X_1 = 0.45 \Omega$, $R_2' = 0.12 \Omega$, $X_2' = 0.45 \Omega$, $X_m = 28.5 \Omega$. Compute the stator current and power factor when the motor is operated at rated voltage and frequency with $s = 0.04$. (7)
- (b) Explain the rotor rheostat control of 3 – phase slip ring induction motor. (7)
4. (a) Explain how the revolving magnetic field produced when 3 – phase supply is given to 3 – phase induction motor. (7)
- (b) A 4 – pole induction motor and a 6 – pole induction motor are connected in cumulative cascade. The frequency in the secondary circuit of the 6 – pole motor is observed to be 1.0 Hz. Determine the slip in each machine and the combined speed of the set. Take supply frequency as 50 Hz. (7)
5. A 5000 KVA, 10000 V, 1500 rpm, 50 Hz alternator runs in parallel with other machines. Its synchronous reactance is 20 %. Find for (a) no load (b) full load at power factor 0.8 lagging, synchronizing power per unit, mechanical angle of phase displacement and calculate the synchronizing torque if the mechanical displacement is 0.5° . (14)
6. Define armature reactance and explain the effect of armature reaction on different power factor loads of synchronous generator. (14)
7. (a) Show that the synchronous motor is variable power factor motor. (10)
- (b) State the applications of synchronous motor. (4)
8. (a) Discuss the methods of starting and procedures for starting synchronous motor. (8)
- (b) A 500 – V, 1 – phase synchronous motor gives a net output mechanical power of 7.46 KW and operates at 0.9 power factor lagging. Its effective resistance is 0.8Ω . If the iron and friction losses are 500 W and excitation losses are 800 W, estimate the armature current. Calculate the commercial efficiency. (6)
