INDIAN MARITIME UNIVERSITY

(A CENTRAL UNIVERSITY, GOVT. OF INDIA)

End Semester Examination December 2018

B. Tech. (Marine Engineering)

Semester - III

Electrical Machines – I (UG11T2306)

Date: 09-01-2019 Max Marks: 100

Time: 3 Hrs. Pass Marks: 50

Part A

All Questions are compulsory

(10 × 3 = 30 Marks)

1. (a) What is the purpose of compensating winding? How it is connected?

   (b) Differentiate demagnetizing and cross magnetizing effect.

   (c) What is the significance of residual magnetism in self–excited generator?

   (d) Compare three point and four point starter.

   (e) What do you understand by internal and external characteristics of dc generator?

   (f) Why the dc series motor should never be switched on at no load? Justify.

   (g) What is the significance of ring main distributor?

   (h) What is the purpose of open circuit and short circuit test on transformer?

   (i) Why the transformer efficiency is always high?

   (j) Define voltage regulation in transformer.

Part B (5 × 14 = 70 Marks)

Answer any five of the following

2. (a) Describe the function of each components in dc machine. (7)

   (b) A 4 – pole, 50 kW, 250 – V, wave – wound shunt generator has 400 armature conductors. Brushes are given a lead of 4 commutator segments. Calculate the demagnetization ampere turns per pole if shunt field resistance is 50 ohms. Also, calculate extra shunt field turns per pole to neutralize the demagnetization. (7)

3. (a) What are the conditions of voltage buildup of a shunt generator. What is the significance of critical resistance? (7)

(b) A 25 kW, 250 – V, d.c. shunt generator has armature and field resistance of 0.06 ohms and 100 ohms respectively. Determine the total armature power developed when working (i) as a generator delivering 25 kW output and (ii) as a motor taking 25 kW input. (7)

4. (a) A 2 – pole series motor runs at 707 r.p.m. when taking 100 A at 85 V and with field coils in series. The resistance of each field coil is 0.03 ohms and that of the armature 0.04 ohms. If the field coils are connected in parallel and load torque remains constant, find (i) speed (ii) the additional resistance to be inserted in series with the motor to restore the speed to 707 r.p.m. (7)

(b) Explain ward – leonard system, with neat diagram (7)

5. (a) Discuss the types of dc distribution system. (7)

(b) Explain the operation of air circuit breaker with neat sketch. (7)

6. (a) Explain the operation of single – phase transformer and draw the phasor diagram for no – load condition. (7)

(b) A single – phase transformer with a ratio of 440 / 110 V 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 0f 0.8 lagging, estimate the current taken by the primary. (7)

7. (a) Discuss back to back test on transformer, with neat diagram. (7)

(b) A transformer has copper loss of 1.5% and reactance drop of 3.5% when tested at full – load. Calculate its full – load regulation at (i) unity power factor (ii) 0.8 power factor lagging and (iii) 0.8 power factor leading. (7)

8. (a) show that at maximum efficiency of transformer copper loss which is equal to iron loss. (4)

(b) A 500 – kVA, 3 – phase, 50 – Hz transformer has a voltage ratio (line voltages) of 33 / 11 kV and is delta / star connected. The resistance per phase are: high voltage 35 ohms, low voltage 0.876 ohms and the iron loss is 3050 watts. Calculate the value of efficiency at full – load and one – half of full load respectively (i) at unity power factor (ii) 0.8 power factor leading. (10)

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