

INDIAN MARITIME UNIVERSITY
(A central University, Government of India)

May/June 2018-END SEMESTER EXAMINATION
B. Tech (Marine Engineering)
Semester: I
Electrical Machines I (UG11T2306/T1306)

Date: 13-07-2018
Time: 3 hrs

Maximum Marks: 100
Pass Marks : 50

Part A (Compulsory Question) (3 x 10=30)

1. (a) Name the components of a DC Machine.
(b) Compare the DC LAP & WAVE windings.
(c) Write the performance equations of a long compound dc generator.
(d) A 12 Pole wave wound DC Generator has a total of 200 coils. Find the flux required per pole to produce an emf of 250V on open circuit with 500 rpm.
(e) What do you mean by **back emf** in a dc motor?
(f) Name the different types of DC Distribution systems?
(g) Define the concept of 'All- day Efficiency' of a Transformer.
(h) Briefly explain the Voltage Regulation in a transformer.
(i) What do you mean by 'CRGO' related to a Transformer?
(j) How much copper is saved by using an Auto-Transformer, justify the answer?

Part B (Answer any Five of the following) (5 x 14=70)

2. (a) Derive the EMF equation for a Lap wound DC generator assuming suitable parameters (6)
(b) Explain what Armature Reaction in a DC Machine is. How can it be reduced (4+4)
3. (a) Draw a neat circuit showing parallel operation of two DC Shunt Generators (5)
(b) The open circuit characteristics of a shunt DC Generator driven at 1000 rpm is as follows:
Field Current: 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6
EMF (Volts): 30 55 75 90 100 110 115 120
If the machine driven at 1000 rpm and has a field resistance of 100Ω , find (i) Open circuit Voltage and exciting current (ii) Critical Resistance and (iii) Resistance to induce 115V on open circuit. (3+3+3)

4. (a) Derive the basic Equation for Torque of a DC Motor. (5)
(b) A lap connected 200V, 8 Pole DC shunt motor has 200 coils. The Armature and Field Resistances are 0.2Ω & 200Ω . Rotational losses are 200W. Neglect other internal voltage drops in the machine. If the flux per Pole is 0.018 Wb with a current drawn as 25A, calculate (i) Electro-magnetic Torque developed (ii) Speed of the machine & (iii) Shaft Power (3+3+3)
5. (a) Draw a neat sketch of a 4 point starter for DC shunt motor. What is the main advantage of a 4 point starter? (6+2)
(b) A 200V, 10KW DC shunt motor runs at 1200 rpm on no load drawing a total current of 2A at 200V. If the Armature & Field resistances are 0.5Ω and 150Ω , find the shaft power and efficiency at full load. (3+3)
6. (a) Compare a Fuse and a Circuit Breaker. (5)
(b) With a neat sketch explain the working of an Oil Circuit Breaker. (9)
7. (a) Why a transformer has leakage Reactance? Explain. (6)
(b) Draw the Phasor diagram of a single phase transformer with upf load & mark the vectors. (8)
8. (a) Discuss the conditions required to parallel two 3 phase Transformers (6)
(b) A 15 KVA, 1100/110V, 50 Hz single phase transformer gave the following results:
OC test (on LV side): 110V, 2A, 150W
SC test (on HV side): 80V, 13.63A, 500W
Determine the parameters of the equivalent circuit, referred to HV side. (8)
