# INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

**END SEMESTER EXAMINATION DECEMBER2017**

**Programme**: B.Tech (Marine Engineering) **Semeste**r: III

**Subject Name**: Electrical Machines- I **Subject Code**:UG11T2306/ UG11T1306

**Date**: 18.12.2017 **Maximum Marks**:100

**Time**: 3 Hours **Pass Marks**:50

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## PART –A

(All Questions are compulsory) (10x3= 30 Marks)

1.(a) Define the term "all day efficiency" for a transformer. (3)

(b) Explain Fleming's Right hand rule for emf in a DC machine. (3)

(c) Explain Fleming's Left hand rule for force in a DC machine. (3)

(d) What is hysteresis loss? (3)

(e) What are the losses in a DC motor? (3)

(f) What are the functions of a starter? (3)

(g) Explain working principle of single phase transformer. (3)

(h) Explain Lenz's law. (3)

(i) Derive an expression for the e.m.f. induced in a transformer winding (3)

(j) State difference between single phase transformer & three phase transformer. (3)

## PART – B (5x14 = 70 Marks)

(Answer any 5 of the following)

2.(a) Draw a neat sketch of a DC Machine showing major parts. (4)

(b) An eight-pole armature is wound with 480 conductors. The magnetic flux and the speed are such that the average e.m.f. generated in each

conductor is 2.2 V, and each conductor is capable of carrying a full-load current of 100A. Calculate the terminal voltage on no load, the output current on full load and the total power generated on full load when the armature is

(i) Lap-connected (5)

(ii) Wave-connected (5)

3.(a)Define voltage regulation of a transformer. Also find the condition for maximum voltage regulation at lagging power factor. (2+4)

(b)A 250 KVA, 11000 V / 400 V, 50 Hz Single-phase transformer has 80 turns on the secondary. Calculate: (4+2+2)

(i) the approximate values of the primary and secondary currents;

(ii) the approximate number of primary turns;

(iii) the maximum value of the flux.

4.(a) Describe Armature Reaction for a DC motor then Problems with Commutation. (7)

(b)Why DC series motor is suitable for goods vehicles? (7)

5.A Single phase transformer has 480 turns on the primary and 90 turns on the secondary. The mean length of the flux path in the core is 1.8 m and the joints are equivalent to an air- gap of 0.1 mm. The value of the magnetic field strength for 1.1 T in the core is 400 A/m, the corresponding core loss is 1.7 W/kg at 50 Hz and the density of the core is 7800kg/ $m^3$

If the maximum value of the flux density is to be 1.1T when a p.d of 220 V at 50 Hz is applied to the primary, calculate:

(i) the cross-sectional area of the core; (4)

(ii) the secondary voltage on no load; (4)

(iii) the primary current and power factor on no load. (6)

6. A d.c motor takes an armature current of 110A at 480 V. The resistance of the armature circuit is 0.2 Ω. The machine has six poles and the armature is lap-connected With 864 conductors. The flux per pole is 0.05 Wb. Calculate

(i) the speed; (7)

(ii) the gross torque developed by the armature. (7)

7.Write short notes on

(a) Speed characteristics of electric motors with reference to shunt-wound motor, series-wound motor & compound-wound motor (3+3+3)

(b) Speed control of d.c. motors including Thyristor system of speed control (3+2)

8.(a) Describe open- circuit test & Short-circuit test on a transformer.

(2+2)

(b) The following results were obtained on a 50KVA transformer: open-circuit test- primary voltage, 3300 V; secondary voltage, 400 V; primary power, 430W. Short-circuit test- primary voltage, 124V; primary current, 15.3 A; primary power, 525W; secondary current, full -load value. Calculate:

(i) the efficiencies at full load and at half load for 0.7 power factor, (5)

(ii) the voltage regulations for power factor 0.7 lagging ; (5)

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