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***B.Tech. Degree III Semester Supplementary Examination in  
Marine Engineering December 2014***

**MRE 302 ELECTRICAL TECHNOLOGY**

Time : 3 Hours

Maximum Marks : 100

(5 × 20 = 100)

- I. (a) Explain the operation of a transformer and sketch phasor diagram on no load. (8)  
 (b) A 10 KVA, 200/400V, 50Hz single phase transformer gave the following test results. (12)  
 OC test (hv winding open) : 220 V, 1.3 A, 120 W  
 SC test (lv winding short circuited) : 22v, 30A, 200 W Find parameters of equivalent circuit as referred to lv winding.
- OR**
- II. (a) Define voltage regulation of a transformer deduce the expression for the voltage regulation. (12)  
 (b) List the conditions that must be fulfilled before the transformers can be operated successfully in parallel. (8)
- III. (a) Explain armature reaction as applied to a dc machine. How its effect can be reduced. (8)  
 (b) A shunt generator has a full load current of 196 A at 220 V. The stray losses are 720 W and the shunt field coil resistance is 55 Ω. If it has a F.L. efficiency of 88%, find the armature resistance. Also find the load current corresponding to maximum efficiency. (12)
- OR**
- IV. (a) Explain the necessity of starters in DC motors. (8)  
 (b) A 250 v dc shunt motor having an armature resistance of 0.25 Ω carries an armature current of 50 A and runs at 750 rpm. If the flux is reduced by 10%, find the speed. Assume that the torque remains the same. (12)
- V. (a) Compare squirrel cage induction motor with step ring induction motor. (8)  
 (b) Draw the circle diagram from no load and short circuit test of a 3 phase, 14.92 kw, 400 v, 6 pole induction motor from the following test results (line values). (12)  
 No. load : 400 v, 11A, Pf = 0.2  
 Short circuit : 100 v, 25 A, pf = 0.4.  
 Rotor culloss at stand still is half the total culloss. From the diagram find (i) line current, slip, efficiency and pf at full load. (ii) the maximum torque.
- OR**
- VI. (a) What are the starting methods used to start 3 phase induction motor. (10)  
 (b) Explain, using double field revolving theory, why the single phase induction motor is not self starting. (10)

(P.T.O.)

VII. (a) Derive emf equation of an alternator and explain coil span factor and distribution factor. (8)

(b) A 3 phase star connected, 1000 kVA, 11,000 V alternator has rated current of 52.5 A. (12)  
The ac resistance of the winding per phase  $0.45 \Omega$ . The test results are given below.

OC test : field current = 12.5 A,

Voltage between lines = 422 V.

SC test: field current = 12.5 A

Line current = 52.5 A

Determine the full load voltage regulation of the alternator

(i) 0.8 pf lagging and

(ii) 0.8 pf leading.

**OR**

VIII. (a) What are the advantages of connecting the alternators in parallel? (8)

(b) A 2.3 kv,  $3\phi$ , star connected synchronous motor has  $Z_s = (0.2 + j2.2)$  ohms per (12)  
phase. The motor is operating at 0.5 power factor leading with a line current of 200 A.  
Determine the generated emf per phase.

IX. (a) Give the composition between DC and AC systems of transmission. (10)

(b) Explain different types of fuses. (10)

**OR**

X. Write short notes on the following. (20)

(i) Three phase 4-wire ac distribution systems.

(ii) Radial and ring main distribution

(iii) Air circuit breakers.

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