

***B.Tech. Degree III Semester Examination in Marine Engineering
December 2012***

MRE 302 ELECTRICAL TECHNOLOGY

Time : 3 Hours

Maximum Marks : 100

- I. (a) Draw the complete phasor diagram of a transformer when the load pf is (10)
(i) lagging (ii) leading.
- (b) Single phase transformer with a ratio of 440/110V takes a no load current of 5A at (10)
0.2 pf lagging. Estimate the current taken by the primary.
- OR**
- II. (a) Define voltage regulation. How it can be obtained from equivalent circuit (10)
parameters?
- (b) A 10 KVA 2500/250V single phase transformer gave the following test results. (10)
OC test: 250V 0.8A 50W
SC test : 60V 4A 80W
- (i) Calculate the efficiency at half full load 0.8 pf.
(ii) Calculate the load KVA at which max efficiency occurs and also the
max efficiency at 0.8 pf.
(iii) Calculate the voltage regulation at 0.8 pf leading.
- III. (a) What is armature reaction? Describe the effects of armature reaction on the (10)
operation of dc machines.
- (b) The brushes of a certain lap connected 400KW, 6-pole generator are given a lead of (10)
18° electrical. From the data given, Calculate: (i) the demagnetizing ampere turns
(ii) the cross magnetizing ampere turns (iii) series turns required to balance the
demagnetising component. The full load current is 750A and the total number of
conductors is 900.
- OR**
- IV. (a) Draw and explain different characteristics of a dc series motor. (10)
- (b) A shunt motor takes 8A on no load. The armature and field resistances are 0.2 Ω (10)
and 250 Ω respectively. Find the efficiency of the machine
- (i) when running as a motor taking a line current of 90A at 500V.
(ii) when running as a generator delivering a current of 90A at 500V.
- V. (a) Derive an expression for torque of an induction motor and obtain the condition for (8)
maximum torque.
- (b) A 6-pole, 50Hz, 3- phase induction motor running on full load with 3% slip (12)
develops a torque of 160 N-m at its pulley rim. The friction and windage losses are
210W and the stator copper and iron losses equal 1640W. Calculate:
(i) Rotor output (ii) Rotor copper loss (iii) Efficiency at full load.

OR

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- VI. (a) Explain with a neat diagram star-delta starting of squirrel cage induction motor. (8)
- (b) Using double field revolving theory explain the torque slip characteristics of a single phase induction motor and prove that it cannot produce any starting torque. (12)
- VII. (a) Compare salient pole and cylindrical rotor synchronous machines. (8)
- (b) The data obtained on 100KVA, 1100V, 3-phase alternator is given below: (12)
- DC resistance test, E between lines = 6 vdc
I in lines = 10Adc.
open circuit test, field current = 12.5A, line voltage = 420V
short circuit test, field current = 12.5A Line current = rated value
Calculate the voltage regulation at 0.8 pf lagging.
- OR**
- VIII. (a) What are the advantages of connecting the alternators in parallel? What are the conditions required to be fulfilled for the successful parallel operation of alternators? (10)
- (b) Give the principle of operation of synchronous motor. Also give the speed frequency relation. (10)
- IX. (a) Explain 2-wire dc system of distribution of electrical power. (10)
- (b) What are the advantages of high voltage transmission? Give its limitations also. (10)
- OR**
- X. Write short notes on: (20)
- (i) Fuses and fuse element materials
(ii) Types of air blast circuit breakers