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***B. Tech. Degree III Semester Examination in
Marine Engineering December 2015***

MRE 1302 ELECTRICAL TECHNOLOGY

Time: 3 Hours

Maximum Marks: 100

(5×20=100)

- I. (a) What are the losses in a transformer? How can it be minimized? Derive the condition for maximum efficiency. (10)
- (b) A 400/200V single phase transformer is supplying a load of 50 A at a power factor of 0.866 lagging. The no load current is 2 A at 0.208 pf lagging. Calculate the primary current and power factor. (10)
- OR**
- II. (a) Explain how the equivalent circuit parameters of a transformer are determined. (10)
- (b) The maximum efficiency of a 500 KVA 3300 / 500 V 50 Hz single phase transformer is 97% and occurs at $\frac{3}{4}$ full load upf. If the impedance is 0.05Ω referred to the 500 V side, calculate the regulation at full load 0.8 pf lagging. (10)
- III. (a) Give the conditions for voltage build up in dc shunt generator. Define critical resistance and critical speed. (10)
- (b) A 250 V compound generator has armature, series field and shunt field resistances of 0.4Ω , 0.2Ω and 125Ω respectively. If the generator supplies 10 KW at rated voltage, find the emf generated in the armature when the machine is connected as (i) long shunt (ii) short shunt. Allow 1 V per brush for contact drop. (10)
- OR**
- IV. (a) Why is a starter necessary for a dc motor? With a neat diagram explain the working of a 3 point starter. (10)
- (b) A 400 V DC shunt motor takes 4A at no load. Its armature and field resistances are 0.4Ω and 220Ω respectively. Estimate the KW output and efficiency when the motor takes 60 A on full load. (10)
- V. (a) Derive an expression for torque under running condition for an induction motor. Also deduce the condition for maximum torque. (8)
- (b) A 6 pole 50 Hz 3 phase induction motor running on full load with 3% slip develops a torque of 160 N-M at its pulley rim. The friction and windage losses are 210 W and stator copper losses and iron losses equals 1640 W. Calculate: (i) Rotor output (ii) Rotor copper loss (iii) Efficiency at full load. (12)
- OR**
- VI. Why is a single phase induction motor not self starting? What are the different methods of making it self starting? Briefly explain any two methods with circuits and vector diagrams. (20)

- VII. (a) Derive the emf equation of an alternator. (8)
- (b) From the following test results, determine the voltage regulation of a 2000 V, single phase alternator delivering a current of 100 A at (i) unity power factor (ii) 0.8 leading pf (iii) 0.7 lagging pf. (12)
- Test results: Full load current of 100 A is produced on short circuit by a field excitation of 2.5 A. An emf of 500 V is produced on D.C. by the same excitation. The armature resistance is 0.8Ω .
- OR**
- VIII. (a) What is meant by hunting in synchronous machines? How can it be avoided? (6)
- (b) What is a synchronous condenser? Explain with vector diagram. (6)
- (c) Calculate the speed and open circuit voltage of a 4 pole, 3 phase, 50 Hz star connected alternator with 36 slots and 36 conductors per slot. The flux per pole is 0.05 wb sinusoidally distributed. (8)
- IX. (a) What are the advantages and disadvantages of dc transmission over ac transmission? (10)
- (b) Explain the use of balancer in a 3-wire dc distribution system with neat diagram. (10)
- OR**
- X. (a) Define and explain the following terms. (10)
- (i) Arc voltage (ii) Restriking voltage (iii) Recovery voltage.
- (b) Discuss the principle of operation of air blast circuit breaker. What are the advantages and disadvantages of using air as arc quenching medium? (10)