

**B. Tech Degree III Semester Examination in
Marine Engineering, March 2008**

MRE 302 ELECTRICAL TECHNOLOGY

Time : 3 Hours

Maximum Marks : 100

(All questions carry EQUAL marks)

- I. (a) Draw the phasor diagram of the transformer on leading pf load and explain it.
(b) A single phase transformer is connected to a 230 V, 50 Hz supply. The net cross sectional area of the core is 60 cm^2 . The number of turns in the primary is 500 and secondary is 100. Determine (i) transformation ratio (ii) emf induced in the secondary winding (iii) maximum value of flux density in the core.
- OR**
- II. (a) Explain with circuit diagrams, the open circuit and short circuit tests to be carried out in the laboratory for the determination of parameters of a single phase transformer.
(b) Two single phase transformers are connected in parallel both primary and secondary. They have resistances of 0.2Ω and 0.1Ω and reactances of 0.35Ω and 0.6Ω respectively referred to secondary side. The no load secondary voltage of each transformer is 550V. Determine the output current of each transformer.
- III. (a) Explain the principle of working of a dc generator. Classify its type and write the general emf equation of a generator.
(b) An 8 pole dc shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.5Ω resistance at terminal voltage of 250V. The armature resistance is 0.24Ω and the field resistance is 250Ω . Find the armature current, induced emf and flux per pole.
- OR**
- IV. (a) Draw and explain the characteristics of a shunt and series motor.
(b) A 500 V dc shunt motor takes 8A on no load. The armature and field resistances are 0.2Ω and 250Ω respectively. Find the efficiency of the machine (i) when run as a motor taking a line current of 90 A at 500V, (ii) when run as a generator delivering a current of 90A at 500V.
- V. (a) Draw and explain the torque-slip characteristics of a 3-phase induction motor.
(b) A 3 - phase, 6 pole, 50Hz induction motor has 160 N-m as its useful full load torque. The rotor emf is observed to make 90 cycles per minute. Calculate : (i) Motor output (ii) Copper losses in rotor (iii) Motor input and (iv) efficiency if mechanical torque lost in friction and windage is 20 N-m and stator losses are 800 w.
- OR**
- VI. (a) Explain using double field revolving theory why the single phase induction motor is not self starting.

(Turn Over)

- (b) A 3 phase 400 V induction motor gave the following test readings :

No load test : 400 V, 1250 W, 9 A

Short circuit test : 150 V, 4 KW, 38 A

Draw the circle diagram.

If the normal rating is 14.91 KW, find from the circle diagram, the full load values of current, pf and slip.

- VII. (a) What are the different types of alternators in use? Explain the essential differences in their construction.

- (b) A 3 – phase star – connected alternator has the following data: Voltage required to be generated on open circuit = 4000 V; Speed = 500 rpm; Stator slots/pole/phase = 3; Conductors/slot = 12.

Calculate : (i) Number of poles and (ii) Useful flux per pole. Assume all conductors per phase to be connected in series and coil to be full pitched.

OR

- VIII. (a) A 2200 V, 3 phase star connected synchronous motor has a resistance of 0.22Ω /phase and a synchronous reactance of 2.4Ω /phase. The motor is operating at 0.6 pf leading with a line current of 180 A. Determine the value of generated emf/phase.

- (b) A 3300 V, 3 phase star connected alternator has a full load current of 100 A. On short circuit a field current of 5 A was necessary to produce full load current. The emf on open circuit for the same excitation was 900 V. The armature resistance was 0.8Ω /phase. Determine the full load regulation for

(i) 0.8 pf lagging (ii) 0.8 pf leading.

- IX. (a) State the advantages and disadvantages of a 3 – wire dc distribution system over a 2 – wire dc distribution system.
- (b) Explain *any four* types of fuses.

OR

- X. Write short notes on the following :

(i) Radial and ring main distribution
 (ii) Three phase 4 – wire a distribution system
 (iii) Minimum oil circuit breaker.

