B. Tech Degree III Semester Examination in Marine Engineering December 2011

MRE 302 ELECTRICAL TECHNOLOGY

Time : 3 Hours Maximum Marks : 100

I. (a) Define the voltage regulation of a transformer. Deduce the expression for voltage regulation. (8)

(b) The following test results were obtained for a 1000/100 V, 100KVA single phase transformer, (12)
OC test:
Primary volts = 1000V, Secondary volts = 100,
Watts in primary = 950

SC test:
Primary volts for full load current = 20, watts in primary = 1000.
Determine the regulation and efficiency of the transformer at full load and at 0.8 powerfactor lagging.

OR

II. (a) List the conditions that must be fulfilled before the transformers can be operated successfully in parallel. (8)

(b) A 3 phase step-down transformer takes 15A when connected to 4400V mains. The turns ratio per phase is 10. Neglecting losses find the secondary line voltage, line current and output if the transformer windings are connected (12)
(i) star/delta (ii) delta/star.

III. (a) Explain the armature reaction in dc machines. (8)

(b) The armature, series filed and shunt field resistances of 240V long shunt compound motor are 0.1Ω, 0.06Ω and 80Ω respectively. If it draws 25A from the mains and its stray losses are 610W, calculate the overall efficiency of the motor. (12)

OR

IV. (a) Explain the procedure for connecting a shunt generator in parallel with others already supplying a load. (8)

(b) A 250V series motor in which the total armature and field resistance is 0.15Ω is working with unsaturated filed, taking 120A and running at 750rpm. Calculate at what speed the motor will run when developing half the torque. (12)

V. (a) Explain the principle of operation of a 3ϕ inductions motor. (8)

(b) A 3 phase, 400V induction motor gave the following test readings: (12)
No-lead test : 400V, 1250W, 9A
Short circuit test : 150V, 4KW, 38A
Draw the circle diagrams. If the normal rating is 14.91 KW, find from the circle diagram, the full-load values of current, powerfactor and slip.

OR

VI. (a) Explain, using double field revolving theory, why the single phase induction motor is not self starting. (10)

(b) What are the various types of starters used for squirrel cage induction motor? (10)

(P.T.O.)

VII. (a) Derive an expression for the voltage induced in an alternator. (8)

(b) A 3 phase, star connected alternator has the following data: voltage required to be generated an open circuit = 4000V (at 50 Hz); Speed = 500rpm; Stator slots/pole/phase = 3; Conductor/slot = 12 Calculate: (i) number of poles (ii) useful flux/pole. Assume all conductors per phase to be connected in series and coil to be full pitched. (12)

OR

VIII. (a) What is meant by hunting in a synchronous motor? (8)

(b) A 3.3KV, 3ϕ star connected alternator has a full load current of 100A. Under short circuit condition it takes 5A field current to produce full load short circuit current. The e.m.f on open circuit for the same excitation is 900V (line-to-line). The armature resistance is 0.9Ω /phase. Determine synchronous reactance per phase and regulation for (i) 0.8 pf lagging (ii) 0.8 pf leading. (12)

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

(b) A three phase four wire AC system is employed for lighting. Compare the amount of copper required with that needed for a two wire DC systems with the same lamp voltage. (10)
Assume balanced load, same losses and neutral having half the cross section of the respective outers.

OR

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

(i) Radial and ring main distribution

(ii) Fuses and its material

(iii) Air circuit breakers

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