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***B.Tech. Degree III Semester Supplementary Examination in  
Marine Engineering December 2016***

**MRE 302 ELECTRICAL TECHNOLOGY  
(Prior to 2013 scheme)**

Time : 3 Hours

Maximum Marks : 100

- (5 × 20 = 100)
- I. (a) What are the different losses in a transformer on load? How can these losses be determined experimentally? (10)
- (b) A 50 KVA, 4400/220v transformer has  $R_1 = 3.45\Omega$ ,  $R_2 = 0.009\Omega$ . The value of reactances are  $X_1 = 5.2\Omega$  and  $X_2 = 0.015\Omega$ . Calculate for the transformer (i) the equivalent resistance reactance and impedance with referred to both primary and secondary (ii) total copper loss. (10)
- OR**
- II. (a) A 200 KVA, 6600/400V, 50Hz single phase transformer has 80 turns on the secondary. Calculate (i) the approximate values of the primary and secondary currents (ii) the approximate number of primary turns and (iii) the maximum value of flux. (8)
- (b) Distinguish between current transformer and potential transformer. (6)
- (c) A 10 KVA, 500/250V single phase 50 Hz transformer has a maximum efficiency of 97% at 85% of full load at unity P.F. Determine the efficiency at full load at 0.8pf lagging. (6)
- III. (a) Derive the emf equation of a dc generator. (5)
- (b) An 8 pole dc shunt generator has 778 wave connected armature conductors running at 500 rpm, supplies a load of  $12.5\Omega$  resistance at a terminal voltage of 250 V. The armature resistance is  $0.24\Omega$  and the field resistance is  $250\Omega$ . Find out the armature current, the induced emf and the flux per pole. (9)
- (c) Draw and explain the external characteristics of a dc shunt generator. (6)
- OR**
- IV. (a) Describe Swinburne's test to determine the efficiency of a dc machine. What are the advantages and disadvantages of this test? (10)
- (b) A 460V DC series motor runs at 500 rpm taking a current of 40A. Calculate the speed and percentage change in torque if the load is reduced so that the motor is taking 30A. Total resistance of the armature and field circuits is  $0.8\Omega$ . Assume the flux is proportional to the field current. (10)

- V. (a) The power input to a 6-pole, 50 Hz, 3 phase induction motor is 700 w at no load and 10 kw at full load. The no load copper losses may be assumed negligible while the full load stator and rotor copper losses are 295w and 310 w respectively. Find the full load speed, shaft torque and efficiency of the motor assuming rotational and core losses to be equal. (10)
- (b) Explain how the speed of slip ring Induction motor can be changed by changing the rotor circuit resistance. What are the limitations and disadvantages of this method. (10)

## OR

- VI. (a) A 500V, 30 hp, 3 phase, 4 pole, 50Hz delta connected squirrel cage induction motor has the following test results. (10)  
 No load test : 500V 8.3 A 1.5KW  
 Blocked rotor test : 100V 32A 1.6 kw  
 Draw the circle diagram and find the (i) line current (ii) power factor (iii) efficiency and (iv) maximum output.
- (b) Derive the expression for developed torque in a 3 phase Induction motor and find the condition for maximum torque. (10)

- VII. (a) What are the different types of ac generators in use? Explain the essential differences in their construction. (8)
- (b) Derive the relation between number of poles, the frequency and speed of the alternator. (4)
- (c) Calculate the speed and open circuit voltage of a 4 pole, 3 phase, 50 Hz star connected alternator with 36 slots and 30 conductors per slot. The flux per pole is 0.05wb sinusoidally distributed. (8)

## OR

- VIII. (a) Explain with diagram any one method of synchronizing two 3 phase alternators. (10)
- (b) Explain the effects of varying the excitation on armature current and power factor of a 3 phase synchronous motor when the input to the motor is maintained constant. (10)

- IX. (a) Compare overhead and underground distribution system. (10)
- (b) Write short notes on the following. (10)
- (i) Difference between dc and ac distribution
  - (ii) Systems of ac distribution

## OR

- X. (a) What are the advantages and disadvantages of dc transmission over ac transmission? (10)
- (b) What is electric power supply system? Draw a single line diagram of a typical ac power supply scheme. (10)