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***B.Tech. Degree III Semester Examination in  
Marine Engineering December 2019***

**MRE 1302 ELECTRICAL TECHNOLOGY**

*(2013 Scheme)*

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Draw and explain the phasor diagram of a transformer on RL load. (8)
- (b) Obtain equivalent circuit of a 10kVA, 200/400V, 50Hz single phase transformer as referred to low voltage winding from following data: (12)
- OC Test: 200V, 1.3A, 120W.
- SC Test: 22V, 30A, 200W
- OR**
- II. (a) Explain the various losses in a transformer? What are the constant and variable losses? (8)
- (b) A 5kVA, 220/110V single phase transformer has the maximum efficiency of 96.97% at 0.8 pf lagging. Its core loss is 50W and full-load regulation at 0.8 pf lag is 5%. Find the efficiency and regulation at 3/4<sup>th</sup> full load 0.9 lagging. (12)
- III. (a) Explain Armature reaction and its effects. What is compensating winding? (10)
- (b) A separately excited DC generator has no-load voltage 120V at a field current of 2A when driven at 1500 rpm. Assuming it is operating on straight line portion of magnetisation curve, calculate: (10)
- (i) Generated emf when field current is increased to 2.5A,
- (ii) Generated emf when speed is reduced to 1400rpm and field current is increased to 2.85A.
- OR**
- IV. (a) Draw and explain the operating characteristics of DC shunt and DC series motor. (10)
- (b) When running on no load a 400V shunt motor takes 5A. Armature resistance is 0.5Ω and field resistance is 200Ω. Find output of motor and efficiency when running on full load and taking a current of 50A. Also find % change in speed from no-load to full-load. (10)
- V. (a) A three phase 6 pole 50Hz induction motor has 160Nm as its useful full load torque. The rotor emf is observed to make 90 cycles/min. Calculate motor output, copper losses in rotor and motor input if stator loss is 800W and mechanical torque lost is 20Nm. (12)
- (b) Explain with neat diagram star-delta starting of three phase induction motor. (8)
- OR**
- VI. (a) Explain: (8)
- (i) Capacitor start Capacitor run single phase Induction motor. (5)
- (ii) Shaded pole induction motor. (5)
- (b) A 6 pole 50Hz 3 phase slip ring induction motor has resistance and reactance of 0.5Ω and 5Ω respectively. Calculate (i) at what speed the torque is maximum, (ii) the ratio of maximum torque to starting torque. What must be the external resistance per phase so that the starting torque is half of the maximum torque? (10)

- VII. (a) Derive the emf equation of an alternator. (6)  
 (b) What are the advantages of rotating field over rotating armature in an alternator? (4)  
 (c) A 3 phase 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 wb, sinusoidally distributed and the speed is 375 rpm. Find the phase and line emf. Assume full pitched coil. (10)
- OR**
- VIII. (a) What are the advantages of connecting alternators in parallel. State the conditions for successful parallel operation of alternators? (10)  
 (b) What is hunting in synchronous machines? (5)  
 (c) Explain any one method of starting synchronous motor. (5)
- IX. (a) Compare AC and DC transmission of Electric power. (8)  
 (b) Explain 3 wire and 2 wire DC distribution system. (7)  
 (c) Write short notes on Fuses and its types. (5)
- OR**
- X. Write short notes on:  
 (a) Three phase 4 wire ac distribution system (6)  
 (b) Radial and Ring main distribution (7)  
 (c) Air circuit breaker (7)

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