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Question Paper Code: 55304

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fifth Semester

Electrical and Electronics Engineering

15UEE504-ELECTRICAL MACHINE DESIGN

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The output of a rotating electrical machine is limited by CO1- R
 - (a) Size of the machine
 - (b) Peripheral velocity
 - (c) Temperature rise
 - (d) None of the above
2. What are the parameters which comes under the term “Main Dimensions”? CO1- U
 - (a) Diameter
 - (b) Length
 - (c) Diameter and length
 - (d) Area
3. What is the formula for total number of turns in the magnet coils? CO2- R
 - (a) Total number of turns = mmf per coil * current
 - (b) Total number of turns = mmf per coil / current
 - (c) Total number of turns = mmf per coil – current
 - (d) Total number of turns = mmf per coil + current
4. How many electromagnets are commonly present? CO2- U
 - (a) 2
 - (b) 3
 - (c) 4
 - (d) 5
5. How is the circulation of oil improved in tanks with tubes? CO3- R
 - (a) It can be improved by using dissipating heat
 - (b) It can be improved by using more effective air circulation
 - (c) It can be improved by using more effect power flow
 - (d) It can be improved by using more effective heads of pressure

6. Compared to the natural cooling, how much of heat dissipation is increased by air blast cooling? CO3- U
 (a) 50-70% (b) 60-70% (c) 50-60% (d) 40-60%
7. What is the relation of closed slots with leakage reactance? CO4- R
 (a) Closed slots give no leakage reactance (b) Closed slots give high leakage reactance
 (c) Closed slots give low leakage e (d) Closed slots give negative leakage
8. What is the formula for the full load rotor mmf? CO4- U
 (a) 65% of stator mmf (b) 75% of stator mmf
 (c) 85% of stator mmf (d) 90% of stator mmf
9. Short circuit ratio for turbo-alternators is usually CO5- R
 (a) 0.1 to 0.2 (b) 0.2 to 0.4 (c) 0.5 to 0.7 (d) 0.8 to 0.95
10. What is the relation of closed slots with leakage reactance? CO5- Ana
 (a) Closed slots give no leakage reactance (b) Closed slots give high leakage reactance
 (c) Closed slots give low leakage (d) Closed slots give negative leakage

PART – B (5 x 2= 10 Marks)

11. What are the main dimensions in machine design? CO1- R
12. Mention the factors governing the choice of number of armature slots in a dc machine. CO2- Ana
13. How the heat dissipation is improved by providing the cooling tubes? CO3- App
14. What types of slots are preferred for the induction motor? CO4- U
15. Name the two types of synchronous machines. CO5- Ana

PART – C (5 x 16= 80 Marks)

16. (a) Explain the thermal consideration of electrical machines. CO1- U (16)
 Or
- (b) Explain the choice of specific magnetic loading for rotating electrical machines. CO1-Ana (16)
17. (a) Derive an output equation for DC machine in terms of output coefficient. Also write the significance of output coefficient in the machine design. CO2-App (16)

Or

- (b) Determine the diameter, length of the armature core, number of armature conductors and slots for a 55 kW, 110V, 1000 rpm, 4 pole dc shunt generator. Assume: Specific magnetic loading 0.5T, Specific electric loading 13000 ampere –turns, Pole arc 70% of pole pitch and length of core about 1.1 times the pole arc, Allow 10A for field current and a voltage drop of 4V for the armature circuit. CO2-App (16)
18. (a) Derive the output equation of Single Phase and three phase transformer. CO3-App (16)
- Or
- (b) Derive an expression to calculate number of cooling tubes required for a transformer tank. Write the significance of providing cooling tubes in transformer. CO3-App (16)
19. (a) A 90 kW, 500V, 50 Hz, 3 Phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. If the slip ring voltage on open circuit is to be about 400 V, find a suitable rotor winding, stating:
- (a) Number of slots
- (b) number of conductors per slot
- (c) slip ring voltage on open circuit
- (d) approximate full load current per phase in rotor. Assume efficiency = 0.9; power factor = 0.86. CO4-App (16)
- Or
- (b) Explain the design steps involved for squirrel cage rotor employed in three phase induction motor. CO4-U (16)
20. (a) Derive the output equation for a synchronous machine. CO5- App (16)
- Or
- (b) Explain the design procedure of field winding of synchronous machine. CO5- U (16)

