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B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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.   Specific resistance of Aluminium is_____ times that of Copper.   CO1- R

(a) 2   (b) 1.64   (c) 0.64   (d) 0.82

2.   What are the parameters which comes under the term "Main   CO1- U
Dimensions"?

(a) Diameter   (b) Length   (c) Diameter and length   (d) Area

3.   Gap contraction factor for slots and ducts are 1.15 and 1.09   CO2- R
respectively. Total gap contraction factor is

(a) 1.1   (b) 1.09   (c) 1.25   (d) 0.95

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.   The type of coil preferred for Transformer is _____coil   CO3- U

(a) Square   (b) Circular   (c) Eliptical   (d) All three types

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 leakag 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. The function of damper winding in alternator is CO5- Ana

    (a) Stop Alternator (b) Increase voltage

    (c) Increase hunting (d) Reduce hunting

PART – B (5 x 2= 10 Marks)

11. Define Space factor. 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. List the values of L / τ for different design requirements of an Induction motor. CO4- U

15. Define Short Circuit Ratio CO5- Ana

PART – C (5 x 16= 80 Marks)

16. (a) Illustrate the various duty types of Electrical machines with neat diagrams. 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) Explain the various steps in the design of armature winding of DC machine. CO2-App (16)

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18. (a) The tank of 1250 kVA natural oil cooled transformer has the CO3-App (16)
dimensions length, width and height as $0.65 \times 1.55 \times 1.85$ m
respectively. The load loss = 13.1 kW, loss dissipation due to
radiations 6 W/m.sq – ^{0}C. improvement in convection due to
provision of tubes = 40% , temperature rise is 40 ^{0}C , length of
each tube is 50 mm. Find the number of tubes for this transformer.
Neglect the top and bottom surface of the tank as regards the
cooling.

Or

(b) Derive an expression to calculate number of cooling tubes required CO3-App (16)
for a transformer tank. Write the significance of providing cooling
tubes in transformer.

19. (a) Find the main dimension of a 15 kW , 3 phase, 400V, 50Hz, 2810 CO4-App (16)
rpm squirrel cage induction motor having an efficiency of 0.88 and
full load power factor of 0.9. Assume: Specific magnetic loading =
0.5 Wb/m^2 specific electric loading = 25000 ac/m. Take the rotor
peripheral speed as approximately 20 m/s at synchronous speed.

Or

(b) Explain the design steps involved for squirrel cage rotor employed CO4-U (16)
in three phase induction motor.

20. (a) Derive the output equation for a synchronous machine. CO5- App (16)

Or

(b) Determine the main dimension of stator core for an 8 pole alternat CO5- U (16)
at 3300 KVA,A, 300V, 50 Hz. Assume specific electric loading to l
28000 ac/m and magnetic loading to be 0.6 Wb/m^2. Pole arc = 0.65
pole pitch. Assume square pole.

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