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Question Paper Code: 53302

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

Third Semester

Electrical and Electronics Engineering

15UEE302 - DC MACHINES AND TRANSFORMERS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

Answer All Questions

1. The principle of dynamically induced emf is utilized in CO1- R
(a) transformer (b) choke (c) generator (d) thermocouple
2. Laminated cores, in electrical machines are used to reduce CO1- R
(a) Copper loss (b) eddy current loss
(c) Hysteresis loss (d) all of the above
3. The primary and secondary of a transformer are _____ coupled but CO2- U
_____ connected.
(a) magnetically, not electrically (b) electrically, not magnetically
(c) magnetically, also magnetically (d) electrically, also electrically
4. A 5 KVA transformer has a turns ratio of $N_1/N_2 = 10$. The impedance of CO2- U
primary winding is $3+j5$ ohms while that of secondary winding is $0.5+j0.8$
ohms. The impedance of transformer when referred to primary will be
(a) $3.5+j5.8$ ohms (b) $8+j13$ ohms (c) $53+j85$ ohms (d) $3.05+j5.08$ ohms

5. Magnetic stored energy density for iron is given by _____ CO3- R
 (a) $1/2 B/\mu$ (b) $1/2 B^2 \mu$ (c) $1/2 \phi^2 Rl$ (d) $1/2 B^2/\mu$
6. Electromagnetic force and/or torque developed in any physical system, acts in such a direction as to tend to _____ CO3- R
 (a) increase both the field energy and co-energy at constant current
 (b) increase the field energy and decrease the co-energy at constant current
 (c) decrease both the field energy and co-energy at constant current
 (d) decrease both the field energy and co-energy at constant current
7. In DC generators, the residual magnetism is of the order of CO4- App
 (a) 2.5% (b) 10% (c) 15% (d) 25%
8. Armature reaction will CO4- R
 (a) Cause distortion of flux (b) Causes sparking
 (c) Shifts brush axis from GNA (d) All of the above
9. If field current is decreased in shunt dc motor, the speed of the motor CO5- R
 (a) remains same (b) increases
 (c) cannot be used on inductive loads (d) advised only for load with high time constant
10. If the applied voltage to a dc machine is 230 V, then the back emf for maximum power developed is CO5- R
 (a) 115 V (b) 200 V (c) 230 V (d) 400 V

PART – B (5 x 2= 10Marks)

11. Define magnetic reluctance. CO1- U
12. Differentiate between core type and shell type transformers. CO2- R

13. What is meant by co energy. CO3- R
14. What is the use of interpole in DC machines. CO4- U
15. Why should a dc series motor not be run without load and it is ideally suited for traction purposes? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Discuss the properties of magnetic materials and explain the B-H relationship using a typical B-H curve and hysteresis loops. CO1-U (16)
- Or
- (b) (i) Compare between electric and magnetic circuits. CO1-Ana (6)
- (ii) Explain about statically and dynamically induced emf. CO1 -U (10)
17. (a) The following data were obtained on a 20 KVA,50 Hz,2000/200 V distribution transformer:
 OC test With HV open circuited 200V,4A,120W
 SC test with LV short circuited 60V,10A,300W
 Draw the approximate equivalent circuit of the transformer referred to the HV and LV sides respectively. CO2 -Ana (16)
- Or
- (b) (i) A 40 kVA, 3300 / 240 V, 50 Hz supply single-phase transformer has 660 turns on the primary. Determine (i) the no. of turns on secondary (ii) the maximum value of flux in the core (iii) the approximate value of primary and secondary full load currents. CO2 -U (8)
- (ii) Derive the equation of EMF equation of single phase transformer CO2 -U (8)
18. (a) Explain in detail multiply (or) doubly excited magnetic system CO3- Ana (16)
- Or
- (b) Explain about the magnetic field in rotating machines. CO3- U (6)

19. (a) Explain the construction and operation of DC generator CO4- Ana (16)
- Or
- (b) Explain in detail about CO4 -U (16)
- (i) Armature reaction
- (ii) Commutation in DC machines
20. (a) Write in detail about various types DC motors with their corresponding speed torque characteristics. CO5- U (16)
- Or
- (b) (i) A 4-pole, dc shunt motor has flux of 0.04 Wb and armature is lap wound with 720 conductors. The shunt field resistance is 240 Ω and the armature resistance is 0.2 Ω . Total brush drop is 2 V. Determine speed of the machine when running (a) as a motor taking 60 A and (b) as a generator supplying 120 A. The terminal voltage in each case is 480 V. CO5- U (8)
- (ii) The torque on the armature with a smaller diameter will be larger than the torque on a large diameter in the case of dc machine for the same current and flux in the air gap. State whether the above statement is correct or wrong and state the reasons by deriving the necessary equation. CO5- U (8)