

Laboratory

T. E. (E) V (REV.)

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Con. 2607-08.

Electrical Machine I  
(REVISED COURSE)

CO-9949

(3 Hours)

[Total Marks : 100

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- N.B. : (1) Question No. 1 is compulsory.  
 (2) Answer any four out of remaining questions.  
 (3) Assume data wherever necessary.

- 1 (a) Explain with a neat sketches, the armature reaction in DC machines. 10  
 (b) State and explain in detail the conditions to be satisfied for parallel operation of two three phase transformers. 10
- 2 (a) Using the principle of field energy density, derive an expression for the torque developed by a singly excited elementary two pole reluctance motor, assuming constant current conditions. 10  
 (b) In a doubly excited rotary machine, the inductance co-efficients are  $L_{11} = (1.1 + 0.4\cos 2\theta)$ ;  $L_{22} = (0.03 + 0.005\cos 2\theta)$ ;  $L_{12} = 0.2 \cos \theta$ . The exciting currents are  $i_1 = 8A$  and  $i_2 = 50A$ . obtain the torque/angular displacement relation. 10
- 3 (a) The temperature of a transformer determined under either no load condition or short circuit condition, does not give true temperature rise experienced in practice. Discuss this and explain a suitable method of determining the temperature rise of a transformer. 10  
 (b) Two similar 40 KVA, single phase transformers gave the following results when tested by the back to back method: 10  
 $W_1$  in supply line 800 watts  
 $W_2$  in the secondaries series circuit at rated current 1000 watts  
 Calculate the efficiency of each transformer at unity p.f.
- 4 (a) Two shunt motors loaded for the Hopkinson test takes 8.2A at 220V from the supply. Motor takes total 28.2A., motor field current is 0.84A, generator field current is 0.7A, armature resistance for motor is 0.5 ohms and for generator is 0.68 ohms. Find the efficiency of machine working as a motor and generator. 10  
 (b) Explain how you conduct Hopkinsons test? What are the advantages and disadvantages of this test? 10

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- 5 (a) Explain harmonics in 3 phase transformer (star-star without neutral) with interlinked magnetic circuit. 10
- (b) Two single phase transformers rated 1000 KVA and 500 KVA have per unit leakage impedance of  $(0.02 + j0.06)$  and  $(0.025 + j0.08)$  respectively. What is the largest kVA load that can be delivered by the parallel combination of these two transformers without loading any one? 10
- 6 (a) Explain working of interpoles and compensating winding used in DC machine. 10
- (b) A 200V dc series motor runs at 1000 rpm takes 20A, combine resistance of armature and series field is 0.4 ohm. Calculate resistance to be inserted so as to reduce the speed to 800rpm assuming torque proportional to the square of speed and linear magnetisation curve. 10
- 7 (a) What are vector groups in case of transformer? Explain group no. 3 connection in detail. 10
- (b) Explain the speed control method of DC shunt and series motors in detail. 10

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