(b) In a 50 kVA, 11 kV/400 V transformer, the iron and copper losses are 500 W and 600 W respectively under rated conditions. Calculate the efficiency on unity power factor at full load. (2)

Roll No. ..... Total Pages : 4

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Mar. 2022

B.Tech. (EL) III SEMESTER

Electrical Machines-1 (ELPC-303)

Time : 90 Minutes] [Max. Marks : 25

Instructions :

1. *It is compulsory to answer all the questions (1 mark each) of Part-A in short.*
2. *Answer any three questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) List various conditions for parallel operation of single phase transformers. (1)

(b) Difference between autotransformer and resistive potential divider. (1)

(c) What parameters of the equivalent circuit of a transformer can be determined from short circuit test? (1)

(d) Find the turns ratio (primary to secondary) of a 11,000/415 V, delta/star connected three-phase transformer. (1)

(e) List various methods of three-phase to six-phase conversion. (1)

(f) Identify suitable dc motor for the following applications (i) Electric traction (ii) Vaccum cleaners. (1)

(g) List the various examples of the doubly excited system. (1)

(h) What is the function of interpoles? (1)

(i) Calculate the voltage regulation of a transformer in which the percentage resistance drop is 2% and percentage reactance drop is 4%, when the power factor is 0.8 leading. (1)

(j) Define critical resistance and critical speed in case of dc machines. (1)

PART-B

2. (a) Draw the phasor diagram of single-phase transformer for leading power factor load. (3)

(b) Why short circuit test is performed on HV side of a transformer? Which parameters of the equivalent circuit can be found using this test? (2)

3. (a) List different ways of regaining the phenomenon of self-excitation or residual magnetism in dc self-excited generators. (2)

(b) A 220 V dc series motor runs at 700 rpm when operating at its full-load current of 20 A. The motor resistance is 0.5 Ω and the magnetic circuit is assumed to be unsaturated. What will be the speed if (a) the load torque is increased by 44% (b) the motor current is 10 A? (3)

4. (a) Draw the speed-torque characteristics of a dc shunt and dc series motor in one figure and compare them. Which characteristic is more suitable for traction purpose and why? (2)

(b) Describe briefly the Swinburne's test with the help of the neat diagram. (3)

5. (a) Draw the developed winding diagram of a progressive lap winding for a 4-pole, 16 slot single layer. (3)

(b) Explain briefly the double delta connection used for three-phase to six-phase transformation. (2)

6. (a) For an electromagnetic system, show that the mechanical work done is equal to the area enclosed between the two magnetization curves at open and closed positions of the armature and the horizontal ψ-i locus during the armature movement. (3)