ages and disadvantages of
ansformers for use in $3-\phi$
single unit $3-\phi$ transformer.
two of the following :
f a distribution transformer.
in DC machines.

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EEE401

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121405

Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

ELECTRO-MECHANICAL ENERGY CONVERSION - I

Time : 3 Hours] [Total Marks : 100

Note : Attempt all questions.

1 Attempt any two parts of the following : 10×2=20

(a) Derive an expression for electromagnetic torque in singly excited linear magnetic system.

(b) Write the energy balance equation for motor and generator. Why magnetic field is used as a coupling medium in electromechanical conversion device ?

(c) A doubly excited system has a stator inductance of 0.6 H, rotor self inductance=0.3 H and mutual inductance=0.4 H. The value of the rotor and the stator current under steady state are 10A and 8A. Calculate the total stored magnetic field energy.

2 Attempt any two parts of the following . **10×2=20**

(a) What is reactance voltage ? How is it produced in a DC machine ? Also explain its effects on the performance of DC machine.

(b) A 6-pole DC shunt generator supplies full-load current at a terminal voltage of 250 V. The armature and field resistances are 0.042 Ω and 100 Ω respectively. It runs at a speed of 1000 rpm and has 700 lap connected conductors. The voltage across armature resistance is 7.2 V. Find the following :

(i) load current

(ii) emf generated

(iii) the flux/pole.

Neglect brush contact drop.

(c) Compare and contrast between the external characteristics of all types of DC generators.

3 Attempt any two parts of the following : **10×2=20**

(a) A 250 V, 30 kW, 1200 rpm, DC shunt motor has a full load efficiency of 88%. The armature resistance is 0.29 Ω and total brush drop is 2V. The value of the field current is 2A. Determine :

(i) Full load line current

(ii) Full load shaft torque and

(iii) Total resistance in the motor starter to limit the starting current to 1.5 times the full load current.

(b) What is the drawback of a three-point starter ? How are these drawbacks eliminated in a four point starter ?

(c) A 260 V, DC shunt motor draws no load current of 4A. The armature and field resistances are 0.5 Ω and 250 Ω respectively. Find the efficiency of the machine as a generator and that as a motor when the load current is 25 A.

4 Attempt any two parts of the following : **10×2=20**

(a) Describe the back-to-back test for determining the regulation and efficiency of a pair of similar transformer. What are the limitations of this test ?

(b) What is an auto transformer ? Discuss the advantages, disadvantages and applications of auto transformers. Compare the conductor savings of auto transformer with a two winding transformer.

(c) In a scott connection, the loads on the two-phase side are 400 kW and 500 kW, both at 200 V and 08 p.f. lagging. The three phase line voltage is 2200 V. The 400 kW load is on the leading phase on the two-phase side. Neglecting transformer losses, calculate the value of line currents on the three-phase side.

5 Attempt any two parts of the following : **10×2=20**

(a) Find the approximate equivalent circuit of a single-phase 100/1000V transformer having the following test results:

OC Test : 100 V, 1.2 A, 150 W

SC Test : 35 V, 15 A, 750 W

(b) Discuss relative advantages and disadvantages of employed three $1-\phi$ transformers for use in $3-\phi$ operation over employing a single unit $3-\phi$ transformer.

(c) Write short notes on any two of the following :

(i) All-day efficiency of a distribution transformer.

(ii) Armature reaction in DC machines.

(iii) Hopkinson's Test.

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(Following Paper ID and Roll No.

PAPER ID : 121405

Roll No.

B. T

(SEM. IV) THEORY E

ELECTRO-MECHANICAL

Time : **3** Hours]

Note : Attempt all questions

1 Attempt any two parts of

(a) Derive an expression in singly excited linea

(b) Write the energy bala generator. Why ma coupling medium in el device ?

(c) A doubly excited syst of 0.6 H, rotor self in inductance=0.4 H. T the stator current und 8A. Calculate the t energy.