Code No: 123BZ

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2019
ELECTRICAL MACHINES – I
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Give the examples for singly-excited magnetic field system. [2]
b) Explain about the energy balance equation with respect to electromechanical conversion device. [3]
c) Explain the importance of commutating poles or Interpoles. [2]
d) Distinguish between the armature and field winding with respect to Electrical machines. [3]
e) List the applications of series and compound generators. [2]
f) Explain how the voltage is built up in self excited DC generator. [3]
g) Explain the principle of operation of DC Motor. [2]
h) Explain the need for starter in DC motor. [3]
i) What are effects of stray losses in a DC machine? [2]
j) Derive the condition for maximum efficiency of DC machine. [3]

PART-B

(50 Marks)

2. Explain in detail about the doubly excited rotational electromagnetic system with a neat schematic diagram. Derive the force expression. [10]

OR

3. Explain in detail about the mechanism of energy stored in a magnetic field with necessary supporting equations. [10]

4.a) Distinguish between lap and Wave winding.
b) An 8 – pole generator has 500 armature conductors and has a useful flux per pole of 0.065 Wb. What will be the emf generated if it is lap connected and runs at 1000 rpm? What must be the speed at which it is to be driven to produce the same emf if it is wave wound? [5+5]

OR

5.a) Explain the process of commutation and give the different methods of improving commutation.
b) Derive the equations for the demagnetizing and cross magnetizing ampere turns/pole. [5+5]

6.a) Distinguish between internal and external characteristics of a dc generator. How can the internal characteristic be derived from the external characteristic of separately excited generator.

b) Sketch and explain the load characteristics of the following types of DC generators:
i)Series generator ii)Differentially compounded generator. [5+5]

OR

7.a) Explain the significance of critical field resistance of a dc shunt generator.

b) Two shunt generators rated at 200KW at 415V have full load regulation of 5% and 4% respectively. How will they share a current of 800 A while operating in parallel? Find also the terminal voltage. If the machines are supplying a load whose resistance is 0.5Ω, find terminal voltage and their currents. [5+5]

8.a) Discuss the various methods of speed control of DC Motors.

b) A 250 V dc shunt motor having an armature resistance of 0.25Ω carries an armature current of 50 A and runs at 750 rpm. If the flux is reduced by 10 %, find the speed. Assume that the load torque remains the same. [5+5]

OR

9.a) Explain the various characteristics of a shunt DC Motor.

b) The armature of a 4-pole dc shunt motor has a lap winding accommodated in 60 slots, each containing 20 conductors. If the useful flux per pole is 23 mWb, calculate the total torque developed when the armature current is 50 A. [5+5]

10. Explain how Swinburne's test is conducted on a dc machine and give its significance along with relevant diagrams. [10]

OR

11.a) Explain the various losses in DC machine and also draw its power flow diagram.

b) The Hopkinson's test on two shunt machines gives the following results on full load:
Line voltage 250 V
Line current excluding field current 50 A
Motor armature current 380 A
Field currents 5A and 4.2 A
Assuming resistance of each machine as 0.02Ω, determine the efficiency of each machine. [5+5]

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