R18

Code No: 153AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, December - 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 as sub questions.

PART – A

(25 Marks)

1.a) What is the use of laminated armature in a d.c generator? [2]
b) What is the significance of back e.m.f in d.c motor? [2]
c) State the disadvantages of conducting Brake test on d.c machines. [2]
d) State different types of transformers. [2]
e) What are the applications of Auto transformers? [2]
f) What is the purpose of providing brush lead and brush lag in a dc machine? [3]
g) What are the advantages of flux control method used in speed control of d.c machines? [3]
h) Draw the circuit diagram for conducting Swinburne's test. [3]
i) Derive the condition for Zero regulation in a single phase transformer. [3]
j) What are the advantages of poly phase transformers? [3]

PART – B

(50 Marks)

2.a) Derive the expression for induced e.m.f. in a d.c generator.
b) A 25 kW, 220 V, 1600 r.p.m d.c shunt generator with $R_a = 0.1\Omega$ has magnetization characteristic data given below:

I_f (A)	0.0	0.25	0.5	0.75	0.1	1.25	1.5
E_a(V)	10	90	150	190	220	243	250

i) What would be the current and field resistance at terminal voltage of 220 V?
ii) At rated current and rated terminal voltage, find the value of field current and field resistance. Ignore the effect of armature reaction.
iii) Find the electromagnetic torque and power in part (ii)
iv) Under load conditions in part (ii), the field current is $I_f = 1.25$A. Find the field current needed to counter the effect of armature reaction. [4+6]

OR

3.a) Describe the process of voltage build up in self excited generators.
b) For a 4-pole d.c armature with 28 slots and 8 coil sides per slot, find the winding pitches and the commutator pitch for a wave winding. What is the distance between brushes in terms of commutator segments? [5+5]

4.a) Explain the principle of operation of D.C motor with a neat sketch.

b) A 500V d.c series motor drives a load torque which increases as the cube of speed. The armature and series field resistance for the motor are 0.6Ω and 0.8Ω respectively. It is operating at a speed of 1000 r.p.m while drawing a current of 25A. The speed is reduced to 800 r.p.m by connecting a diverter resistance across the armature winding. Calculate the (i) new line current and armature current (ii) value of diverter resistance. [5+5]

OR

5.a) What are the disadvantages of a three point starter? Explain how they can be overcome in a four point starter.

b) A 500 V, 20 kW d.c shunt motor took 2.4 A when running light. For an armature resistance to be 0.5Ω, field resistance of 780Ω and brush drop 0f 2.2 V, find the full load efficiency. [5+5]

6.a) Explain the procedure of conducting Field's test on two identical d.c series motors.

b) A 250 V, 25 kW d.c shunt motor has efficiency of 89% at shaft load of 20 kW and speed of 850 r.p.m. The field resistance is 125Ω. Calculate the rotational loss and armature resistance. What will be the efficiency, line current and speed at an armature current of 100A? [5+5]

OR

7.a) What are the advantages of Hopkinson's test over Swinburne's test and what are its limitations?

b) A D.C shunt motor rated 10 kW connected to 250 V supply is loaded to draw 35A armature current running at a speed of 1250r.p.m. Given $R_a = 0.5\Omega$. Determine (i) the load torque if the rotational loss is 500 Watts. (ii) the motor efficiency if the shunt field resistance is 250Ω and (iii) the armature current for the motor efficiency to be maximum and its value. What is the corresponding load torque and speed? [5+5]

8.a) Explain construction of transformer with its diagram.

b) Draw and explain phaser diagram of transformer with capacitive load. [5+5]

OR

9.a) Discuss the effect of load power factor on voltage regulation of a transformer.

b) Derive EMF equation of a transformer. [4+6]

10.a) Why is an OC test generally performed at rated voltage On the LV side of a transformer?

b) A 600 kVA, single phase transformer with 0.012 p.u resistance and 0.06p.u reactance is connected in parallel with a 300kVA transformer with 0.014 p.u resistance and 0.045p.u reactance to share a load of 800kVA at 0.8p.f lagging. Find how they share the load when the open circuit secondary voltages are respectively 445V and 455V. [4+6]

OR

11.a) What are the necessary conditions to be satisfied for parallel operation of transformers?

b) A 2000 kVA, 6.6/1.1 kV, 3-phase delta-star connected transformer has the following test result. SC test: 200V, 120A, 25 kW. The iron loss during OC test =20 kW. Calculate the percentage resistance, reactance drop, and regulation on full load at p.f of 0.8 lagging. [4+6]

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