Code No: 133AM **R16**

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, c as sub questions.

PART- A

(25 Marks)

1.a) Why pole pitch is expressed in electrical degrees not in mechanical degrees. [2]
b) What features of DC Series generator distinguish it from other types of DC generators? [3]
c) Why the EMF generated in a DC Motor is called back EMF. [2]
d) Explain why a dc motor should not be started direct on line. [3]
e) Why Swinburne's test is preferred instead of Brake test in DC machines? [2]
f) What is retardation test? [3]
g) What is all day efficiency? How it is different from normal efficiency. [2]
h) Distinguish between step-up and step-down transformers? [3]
i) Explain why OC test and SC tests are conducted on LV and HV sides of the transformer respectively? [2]
j) What are the advantages of single three phase transformer unit over a bank of single phase transformers? [3]

PART-B

(50 Marks)

2.a) Distinguish between external and internal characteristics of DC Generators.
b) A 10kW, 6 pole DC Generator develops an e.m.f of 200V at 1500 rpm. The armature has a lap- connected winding. The average flux density over a pole pitch is 0.9T. The length and diameter of the armature are 0.25m and 0.2 respectively. Calculate the flux/pole the torque developed by the machine. [5+5]

OR

3.a) What are the possible causes for not building up emf in self excited DC Generators? What are the remedial measures to be taken?
b) A 230V, 25 kW separately excited DC generator at full load induces an EMF of 235 V. If the brush drop is 1.5V per brush, calculate the armature resistance. [5+5]

4. How 4-point starter is different from 3-point starter. With a neat diagram explain the construction and working of 4-point stator. [10]

OR

5.a) Discuss about the characteristics of DC series motor.
b) A 220 V, DC shunt motor is operating at a speed of 1440 r.p.m. The armature resistance is 1.0 Ω and armature current is 10 A. of the excitation of the machine is reduced by 10%, and find the value of extra resistance to be put in the armature circuit to maintain the same speed and torque. [5+5]

6.a) Explain the Direct method of testing in a dc machine.

b) The Hopkinson test on two similar dc shunt machines gave the following results: Line voltage: 220 V; Line current excluding filed current: 40 A; Armature current of motoring machine: 200 A; field currents are 6 A and 7 A. Calculate the efficiency of each of the machine at the given load conduction. The armature resistance of each machine is 0.05 Ω. [5+5]

OR

7.a) Explain the Brake test in a dc machine.

b) A 200 V DC shunt motor with armature and field resistances of 0.25 ohm and 200 ohm respectively, takes a no load current of 5 A. If it takes 50 A under loaded conditions, find its efficiency as generator. [5+5]

8.a) What is voltage regulation of a transformer? Derive the conditions for maximum and zero voltage regulation in a transformer.

b) A 100 kVA, 2400/240 V, 50Hz single phase transformer has an exciting current of 0.64A and a core loss of 700 W, when its high voltage side is energized at rated voltage and frequency. Calculate the two components of the exciting current. [5+5]

OR

9.a) Draw the exact equivalent circuit of a transformer and describe briefly the various parameters involved in it

b) A 40 KVA single phase transformer has got maximum efficiency of 97 % at 80 % of full load at UPF. During the day, the load on the transformer is as follows.

No. of hours	Load	Power factor
9	6 KW	0.6 lag
8	25 KW	0.8 lag
7	30 KW	0.9 lag

Determine the All day efficiency of the transformer. [5+5]

10.a) Draw the Phasor diagrams and winding connection of three-phase transformer for:
i) Group 1: Phase displacement of zero degrees
ii) Group 3: Phase displacement of -30 degrees

b) A 50 kVA, 2200 V/1100 V single phase 50 Hz transformer has a full-load efficiency of 95% and iron loss of 500 W. The transformer is connected as an Auto-transformer to a 3300 V supply. When it delivers a load of 50 kW at unity power factor at 1100 V, calculate the currents in the windings. [5+5]

OR

11.a) Discuss how parallel operation of two single phase transformers is effected by unequal voltage ratios and unequal per unit leakage impedances but same X/R ratio.

b) In a 25 kVA, 2000/200 V transformer the iron and copper losses are 350 and 400 W respectively. Calculate the efficiency on UPF at (i) full load (ii) half load. (iii) Determine the load for maximum efficiency and the copper loss in this case. [5+5]

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