Sr. No.....

January 2023

B.Tech- III SEMESTER

Electrical Machines-1(ELPC-303)

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

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Any other specific instructions*

PART -A

Q1 (a) Can a transformer work on DC? Justify. (1.5)[CO3]

(b) What type of load should be connected to a transformer for getting zero voltage regulation? (1.5)[CO3]

(c) Which three-phase transformer is used for (i) stepping-down the voltage (ii) small h.v transformers. (1.5)[CO3]

(d) Define (i) pole pitch (ii) front pitch and (iii) commutator pitch (1.5)[CO1]

(e) What do you understand by the term "field flashing" in dc shunt generators? (1.5)[CO3]

(f) Which dc motor is used in (i) lathes and drills (ii) electric traction and cranes (iii) steel rolling mills and paper mills (1.5)[CO3]

(g) Define the terms MMF and reluctance related to magnetic circuits. (1.5)[CO1]

(h) List various differences between autotransformer and potential divider. (1.5)[CO3]

(i) Under what circumstances does a dc shunt generator fail to build up voltage? (1.5)[CO3]

(j) Which methods are adopted to control the speed of a dc shunt motor below and above base speed? (1.5)[CO3]

PART -B

Q2 (a) Draw and explain the phasor diagram of a transformer feeding lagging power factor load. Also depict the effect of leakage flux. (8)[CO3]

(b) A 200KVA transformer has an efficiency of 98% at full load. If the maximum efficiency occurs at three quarters of the full load, calculate the efficiency at half load. Assume negligible magnetising current and p.f of 0.8 at all loads. (7)[CO3]

Q3 (a) In open circuit test, the ohmic losses are negligible in comparison with normal core loss. Explain. (5)[CO3]

(b) Derive an expression for the saving of copper in an auto-transformer as compared to an equivalent two-winding transformer. (5)[CO3]

(c) List various methods of three-phase to six-phase conversion and explain any one method in detail. (5)[CO3]

Q4 (a) Discuss the effect of circulating current at no load in two single-phase transformers operating in parallel. (5)[CO3]

(b) A 10 H.P (Horse power), 230 V dc shunt motor has an armature resistance of 0.5 Ω and field circuit resistance of 115 Ω. At no load and rated (full) voltage the speed is 1200 rpm and the armature current is 2 A. If the load is applied, the speed drops to 1100 rpm. Determine the armature current and the line current. (5)[CO3]

(c) Explain how torque is produced in dc motor? (5)[CO3]

Q5 (a) Explain how the effect of armature reaction can be minimized in the inter-polar zone using Interpoles. (6)[CO3]

(b) Draw and explain the various operating characteristics of dc shunt generator. (6)[CO3]

(c) A dc shunt generator delivers 60 kW at 240 V and 360 rpm. The armature and field resistances are 0.015 Ω and 60 Ω respectively. Calculate the speed of the machine running as a dc shunt motor and taking 60 kW input at 240 V. Allow 1 V per brush for contact drop. (3)[CO2]

Q6 (a) Explain the Swinburne's test to determine the efficiency of a dc machine. What are the limitations of this test? (8)[CO3]

(b) Explain with neat sketches how the speed control of a dc shunt motor is done by Ward Leonard control system. (7)[CO3]

Q7 Write short notes on the followings (any two) (7.5)+(7.5)

On-load tap changing transformers [CO3]

Commutation process in dc machines [CO2]

Classification of magnetic materials [CO1]

****