Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: B.Tech**

Sub_Code: REE4C002/REL4C002

4th Semester Back Examination: 2024-25

SUBJECT: Electrical Machines-I

BRANCH(S): EEE, ELECTRICAL

Time: 3 Hours

Max Marks: 100

Q.Code: S431

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is the function of the dummy coil in the DC machine?

b) What is the information obtained from the short-circuit test of a transformer?

c) Define Biot-Savart Law.

d) The full-load copper loss and iron loss of a transformer are 2000 W and 4000 W, respectively. The copper-loss and iron loss at half load will be, respectively?

e) What is the flux-linkage vs. current characteristic of magnetic circuits;

f) What will be current drawn by 220 V dc motors of armature resistance 0.5 ohm and back emf 200 V?

g) Define flux, reluctance, and inductance of the magnetic circuit.

h) What is the All-day efficiency of a transformer?

i) What is the difference between lap and wave winding?

j) A single-phase transformer when supplied from 200 V, 50 Hz has an eddy current loss of 50 W. If the transform is connected to a voltage of 300 V, 50Hz, the eddy current loss will be?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Derive the torque equation of the DC Machine.

b) Explain with a phasor diagram of the Scott connection.

c) Explain the open circuit test of a single-phase transformer and find the constant loss.

d) Derive the emf equation of the DC generator.

e) Explain the flux-linkage vs. current characteristics of the magnetic circuit.

f) What do you mean by No-load and on-load tap-changing of transformers?

g) Explain the load Characteristics of the D.C Shunt Generator.

h) Explain the voltage built-up principle of the D.C. generator.

i) Draw and explain the torque-speed characteristics of separately excited, shunt and series motors.

j) A 6-pole lap wound D.C. shunt generator has 70 slots with 18 conductors per slot. The ratio of pole arc to pole pitch is 0.6. The diameter of the bore of the pole shoe is 0.35 m. The length of the pole shoe is 0.3 m. Calculate the speed at which it runs if the air gap flux density is 0.32 Wb/m^2 and the e.m.f. induced in the armature is 510 V.

k) The maximum efficiency of a 100 KVA, single-phase transformer is 98% and occurs at 80% of full load at 0.8 power factor lagging. If the leakage impedance of the transformer is 5%, find the voltage regulation at full load.

l) Explain the different Cooling methods used in the transformers.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16x2)**

Q3 What is the armature reaction of the DC machine? Explain the cross-magnetisation and demagnetisation effect. **(16)**

Q4 Explain the commutation of the DC motor and draw the necessary diagram. **(16)**

Q5 Draw the equivalent circuit diagram and phasor diagram of the single-phase transformer. **(16)**

Q6 The 2000/200 V, 20 kVA transformer is connected as a step-up auto-transformer. The 200 V winding has enough insulation to withstand 2200 V to ground. Calculate: (i) The LV and HV side voltage ratings of the autotransformer, (ii) its kVA rating, (iii) kVA transferred inductively and conductively **(16)**