Registration No :

4th Semester Regular / Back Examination: 2022-23
SUBJECT: Electrical Machine-1
BRANCH(S): EEE, ELECTRICAL
Time : 3 Hour
Max Marks : 100
Q.Code : M162
Answer Question No.1 (Part-1) 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 Amper Law?
   b)   What is the purpose of interpoles and compensating windings in dc machines?
   c)   Derive the torque equation of the DC Machine.
   d)   What is the voltage regulation of the transformer?
   e)   Define Biot Savart Law.
   f)   What is the All-day efficiency of a transformer?
   g)   What is the function of the dummy coil in the Dc machine?
   h)   In a transformer at what power factor zero voltage regulation is obtained?
   i)   Explain the difference between zero sequences and 3rd harmonic current.
   j)   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 the half load will be respectively.

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of   (6 × 8)
        Twelve)
   a)   The emf per turn for a single phase, 2310/220 V, 50 Hz transformer is approximately 13 V. Calculate (i) the Number of primary and secondary turns and (ii) the Net cross-sectional area of the core, for the maximum flux density of 1.4 T.
   b)   Explain the short circuit test and find out the total resistance and reactance of the transformer.
   c)   Explain different types of cooling systems used in Transformer.
   d)   230 V dc is shunt motor that has an armature resistance of 0.25 Ω. What resistance must be added in series with the armature circuit to limit the starting current 90 A? With this starting resistance in the circuit, what would be the back emf when the armature current decreases to 30 A?
   e)   Explain the inrush current of the transformer during starting condition.
   f)   Explain the flux-linkage vs current characteristics of the magnetic circuit.
   g)   By using a phasor diagram explain the Scott connection of the transformer.
   h)   Derive the emf equation of the DC generator.

i) Explain the open circuit test and find the constant loss.

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 0.35m. The length of the pole shoe is 0.3m. Calculate the speed at which it runs if the air gap flux density is 0.32 wb/m2 and the e.m.f. induced in the armature is 510V.

k) The efficiency of a 1000 KVA, 110/220 V, 50 Hz, the single-phase transformer is 98.5 % at half load at 0.8 pf leading and 98.8 % at full-load upf. Determine (i) iron loss (ii) Full-load copper-loss.

l) Explain the voltage built-up principle of the D.C Generator.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are the losses taking place in D.C. Machine and how they are very with load current and derive the condition for maximum efficiency. **(16)**

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

Q5 Draw the equivalent circuit, approximate equivalent circuit, and the phase diagram of the transformer. **(16)**

Q6 What is the armature reaction of the DC machine Explain the cross-magnetization and demagnetization effect. **(16)**