Code No: **20EE3T01**

R20

II B. TECH I SEMESTER REGULAR EXAMINATIONS, FEB - 2022
ELECTRICAL MACHINES – I
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours **Max. Marks: 70**

Note: Answer **ONE** question from each unit **(5 × 14 = 70 Marks)**

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UNIT-I

1. a) Draw and deduce the expression for field energy in single excited system. [7M]

   b) Explain the Open circuit characteristics of a dc generator and determine the Critical resistance and critical speed from that. [7M]

(OR)

2. a) Explain the principle of operation of a dc generator and derive its EMF equation [7M]

   b) A 4-pole Wave wound dc shunt generator has a useful flux per pole of 0.09 Wb, the armature winding consists of 200 turns each of 0.004 resistance. Determine the terminal voltage when running at 800 r.p.m. and the armature current is 40 A. [7M]

UNIT-II

3. a) Explain the principle of torque production in a DC motor and derive an Armature Torque expression for it. [7M]

   b) A 440 V DC shunt motor takes a current of 3 A. at no-load. The armature resistance including brushes is 0.3 Ω and the field current is 1 A. Calculate the output and efficiency when the input current is 20 A. [7M]

(OR)

4. a) Determine: i) the total torque developed ii) the useful torque of a 250 V, 4 pole series motor with 782 wave connected conductors developing 8 kW and taking 40 A with a flux per pole of 25 mWb. The armature resistance of the motor is 0.75 ohms. [7M]

   b) Explain the various losses taking place in DC machines. With the help of these losses draw the power flow diagram for a DC Motor. [7M]

UNIT-III

5. a) Explain with the help of a neat sketch the principle of operation of a four-point starter. [7M]

   b) Explain the procedure to predetermine the efficiency of DC Generator by Swinburne's Test. [7M]

(OR)

6. a) Write the purpose of starter in DC Motor and explain With Neat diagram the construction and working of 3-point starter. [7M]

   b) Describe Brake test on DC Shunt Motor to determine the efficiency. [7M]
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UNIT-IV

7. a) Single phase Transformer has 500 turns in primary winding and 1200 turns in secondary. The cross-sectional area of the core is 80 cm^2. If the primary winding is connected to 50 Hz supply at 500 Volts. Calculate (i) Peak flux density (ii) Voltage induced in secondary winding. [7M]

   b) Explain different types of losses in single phase Transformer. [7M]

(OR)

8. a) Explain the Single phase Transformer operation on no load with neat phasor diagram. [7M]

   b) A 50 KVA single phase of 2300/230V rating has the primary and secondary winding resistance of 2 Ω, 0.02 Ω respectively. The iron losses are 421 Watts. Calculate the efficiency at [7M]

      i) Half load at UPF

      ii) Full load at 0.8 p.f

UNIT-V

9. a) Explain the procedure for OC & SC tests of transformer. From the test results explain how to compute equivalent circuit parameters of a single phase transformer? [7M]

   b) Write the conditions for parallel operation of transformers and derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios. [7M]

(OR)

10. a) The OC test (LV side) and SC test (HV side) results of a single-phase 6 KVA, 250/500 V transformer are 250 V, 1.2 A, 80 W and 25 V, 10 A, 95 W respectively. Determine the regulation and of the transformer at full-load at 0.8 p.f. lagging. [7M]

    b) Why is it preferable to operate a bank of transformers rather than three independent single phase transformers? [7M]

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