PVP 20

Code: 20EE3303

II B.Tech - I Semester – Regular Examinations - FEBRUARY 2022

ELECTRICAL MACHINES - I
(ELCTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Describe B-H curve in magnetic materials. 7 M
   b) Explain the analogy between electric and magnetic circuits. 7 M

OR

2. a) Derive expressions for field energy and co-energy in a singly-excited electromechanical unit. 7 M
   b) Calculate the M.M.F required to produce a flux of 5 m Wb across an air gap of 2.5 mm of length having an effective area of 100 cm^2 of a cast steel ring of mean iron path of 0.5 m and cross-sectional area of 150cm^2. The relative permeability of cast steel is 800. Neglect leakage flux. 7 M

UNIT – II

3. a) Derive the EMF equation of DC Generator. 7 M
   b) A 20 kW, 250 V, 6 pole lap connected separately excited dc generator runs at 1250 rpm. Armature has 550 conductors. For full load armature ohmic loss of 250 W, find the useful flux per pole. Take 2 V as the brush drop at full load. 7 M

OR

4. Define commutation. Explain the process of commutation in DC generator with neat sketches. 14 M

UNIT-III

5. a) Explain what is meant by back emf. Explain the principle of torque production in a DC motor. 7 M

   b) A 220V D.C shunt motor at no load takes a current of 2.5A. The resistances of armature and the shunt field are 0.6 ohm and 210 ohm respectively. Estimate the efficiency of the motor when the input current is 20 A. State the assumptions made. 7 M

OR

6. a) Explain the necessity of starter in a DC motor and describe three-point starter with a neat sketch. 7 M

   b) In a brake test on a DC shunt motor, the load on one side of the brake band was 35 kg and the other side 5kg. The motor was running at 1300 rpm; its input being 70 A at 420V DC. The pulley diameter is 1 m. Determine the torque, output of the motor and the efficiency of the motor. 7 M

UNIT – IV

7. a) Define voltage regulation of a transformer and derive conditions for

   i) zero regulation

   ii) maximum regulation. 7 M

b) The primary and secondary windings of a 40 kVA, 6600/250 V single phase transformer have resistances of 10 ohm and 0.02 ohm respectively. The total leakage reactance is 35 ohm as referred to the primary winding. Find full load regulation at a p.f. of 0.8 lagging. 7 M

OR

8. a) A 4.5 kVA, 400/210 V, 50 Hz single phase transformer has the following test data:

O.C. test (L.V.side) 210V, 1A,70 W

S.C. test (H.V.side) 15 V, 10.8A, 100 W

Calculate (i) Equivalent circuit referred to L.V side

(ii) Secondary load voltage on full load at 0.8 power factor lagging

(iii) Efficiency of transformer at ¾ th load and 0.7 power factor lagging. 7 M

b) What are the conditions for satisfactory parallel operation of single phase transformer? Deduce the equations for currents supplied by each transformer when two transformers are operating in parallel with unequal voltage ratio. 7 M

UNIT – V

9. a) Explain the principle and operation of auto transformer. 7 M

b) Distinguish between auto transformer and two winding transformer. 7 M

OR

10. a) With the help of circuit diagrams, explain any two types of three phase transformer connections. 7 M

b) Describe in detail about "OFF-LOAD" and "ON-LOAD" tap changers transformers. 7 M