INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech III SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - FEBRUARY 2023
Regulation:UG20
DC MACHINES AND TRANSFORMERS

Time: 3 Hours   (ELECTRICAL AND ELECTRONICS ENGINEERING)   Max Marks: 70

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) State Fleming's right hand rule. Elaborate the characteristics of shunt, series and compound generator with neat diagram.   [BL: Understand| CO: 1|Marks: 7]

   (b) A wave wound, 6 pole, long shunt compound DC generator has 600 armature conductors. The generator is driven at 300rpm. Calculate the EMF generated if the flux/pole is 0.060Wb. If now, the generator is required to produce EMF of 550V at a reduced value of flux/pole of 0.055Wb, calculate the speed at which the armature of the generator must be driven.

      [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Differentiate DC motor from a DC generator. Discuss the construction of DC motor with neat diagram and mention its parts.   [BL: Understand| CO: 2|Marks: 7]

   (b) A 440V shunt motor has armature resistance of 0.8Ω and field resistance of 200Ω. Determine the back EMF when giving an output of 7.46kW at 85% efficiency.   [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Why Swinburne's test cannot be performed on DC series motor? Explain the various losses present in the DC machine and how it can be reduced?   [BL: Understand| CO: 3|Marks: 7]

   (b) A 100kW, 220V, DC shunt generator has the following data:

   Armature resistance: 0.1Ω

   Mechanical loss: 5kW

   Iron Loss: 5kW

   Shunt field resistance: 220Ω

   Brush contact drop: 1V per brush

   Stray loss: 1% of output

   Find the efficiency at full load. Also find the input torque if the speed is 1000rpm.

      [BL: Apply| CO: 3|Marks: 7]

4. (a) Describe different methods of speed control of DC series motors with relevant circuit diagrams.

      [BL: Understand| CO: 4|Marks: 7]

(b) A DC series motor is running with a speed of 800rpm while taking a current of 20A from the supply. If the load is changed such that the current drawn by the motor is increased to 50A, calculate the speed of the motor on new load. The armature and series field winding resistance are 0.2Ω and 0.3Ω respectively. Assume the flux produced is proportional to the current and supply voltage as 250V. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Develop the EMF equation of single phase transformer and write transformer ratio. List the advantages and disadvantages of parallel operation of transformers.
   [BL: Understand| CO: 5|Marks: 7]

   (b) Obtain the equivalent circuit parameters of a 200/400V, 50 Hz, single phase transformer has the following test data
   OC Test: 200V, 0.7A, 70W – on LV side
   SC Test: 15V, 10A, 85W – on HV side [BL: Apply| CO: 5|Marks: 7]

6. (a) Draw and explain the phasor diagram of a single phase transformer connected with lagging and leading power factor load. [BL: Understand| CO: 5|Marks: 7]

   (b) Find the all day efficiency of a 500kVA distribution transformer whose iron loss and full load copper loss are 1.5kW and 6kW respectively. In a day it is loaded as shown in Table 1.
   [BL: Apply| CO: 5|Marks: 7]

Table 1

Duration	Output in kW	Power factor
6	400	0.8
10	300	0.75
4	100	0.8
4	0	-

MODULE – V

7. (a) Explain the following three phase transformer with winding configuration and phasor diagram
   i) Star-Star
   ii) Delta-Delta
   iii) Star-Delta
   iv) Delta-Star [BL: Understand| CO: 6|Marks: 7]

   (b) A three phase transformer is connected to 6600V on the primary side. The ratio of turns per phase is 10 and the line current drawn from the main is 25A. Find secondary line voltage, current and output if the transformer is connected in star/star and delta/delta. [BL: Apply| CO: 6|Marks: 7]

8. (a) Discuss in detail about no load and on load tap changers used for three phase transformer.
   [BL: Understand| CO: 6|Marks: 7]

   (b) A balanced 3-phase, 100 KW load at 400V and 0.8 p.f lagging is to be obtained from a balanced two phase 1100V lines. Determine the KVA rating of each unit of the scott connected transformer.
   [BL: Apply| CO: 6|Marks: 7]

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