INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.TECH II Semester End Examinations (Regular) AUGUST- 2021

Regulation:UG20

BASIC ELECTRICAL ENGINEERING

Time: 3 Hours   **(AE|ME|CE)**   **Max Marks: 70**

Answer all questions in Modules I and II
Answer ONE out of two questions from Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) State Kirchhoff's voltage law and Kirchhoff's current law. Make short notes on practical sources and ideal sources. **[7M]**

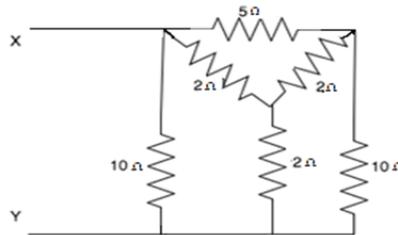   (b) Determine the value of the equivalent resistance across X and Y for the circuit shown in Figure 1. **[7M]**

Figure 1

MODULE – II

2. (a) State and prove Thevenin's theorem with an example for DC excitation. **[7M]**

   (b) Draw the graph from incident matrix and write tie-set matrix. **[7M]**

$$\begin{bmatrix} 1 & 0 & 0 & 0 & -1 \\ -1 & -1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

MODULE – III

3. (a) What are the constructional parts present in the DC generator? Briefly explain about their functionality in the operation of DC generator. **[7M]**

(b) A 4-pole dynamo with wave wound armature has 51 slots containing 20 conductors in each slot. The induced EMF is 357 volts and the speed is 8500rpm.What is the flux per pole? **[7M]**

4. (a) Explain the term back EMF in DC motors. What are the various losses present in the DC motor? **[7M]**

(b) A 440 V DC shunt motor takes a no load current of 2.5A. The resistance of shunt field and the armature are 550 Ω and 1.2 Ω respectively. The full load line current is 32 A. Find the full load output and the efficiency of the motor. **[7M]**

MODULE – IV

5. (a) Demonstrate the working principle of a single-phase transformer. What are the constructional components of a single-phase transformer? **[7M]**

(b) The EMF per turn of a single phase 440/220 V, 50 Hz transformer is approximately 15 V. Find
i) The number of primary and secondary turns.
ii) The net cross sectional area of the core for a maximum flux density of 1 wb/ m^2. **[7M]**

6. (a) Why is the core of a transformer laminated? Derive the EMF equation of a transformer in terms of uniform flux distribution. **[7M]**

(b) In a 50KVA,11 KV/400V transformers, the iron and copper losses are 500W and 600W respectively under rated conditions then what is the efficiency of a transformer under full load at unity power factor? **[7M]**

MODULE – V

7. (a) Describe the principle and operation of an induction motor (IM). Explain the effect of slip on the performance of IM. **[7M]**

(b) The frequency of stator EMF is 50 Hz for an 8-pole three phase induction motor. If the rotor frequency is 2.5 Hz, calculate the slip and the actual speed of rotor. **[7M]**

8. (a) What is an alternator? Explain the principle of operation of an alternator with a neat diagram. **[7M]**

(b) A 4-ploe, 50hz star-connected alternator has a flux per pole of 0.12wb. It has 4 slots per pole per phase, conductors per slot being 4.If the winding coil span is 150^0, find the EMF. **[7M]**

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