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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I Semester End Examinations (Regular) - July, 2021

Regulation: UG-20

## BASIC ELECTRICAL ENGINEERING

Time: 3 Hours

(CSE|IT|CSE(AIML)|CSE(DS)|CSE(CS)|CSIT)

Max Marks: 70

Answer all questions in Module I and II

Answer ONE out of two questions from Modules III, IV and V

All questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

- State and explain Kirchhoff's voltage law and Kirchhoff's current law with neat diagram. [7M]
  - Calculate the three mesh currents for the circuit shown in Figure 1 using mesh current analysis technique. All resistances are in ohms. [7M]

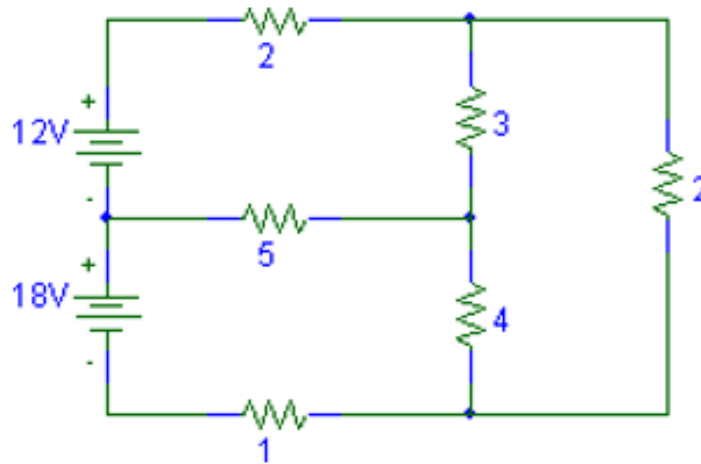


Figure 1

### UNIT – II

- State and prove Thevenin's theorem and explain with an example for DC excitation. [7M]
  - Determine the Norton's equivalent for the circuit given in Figure 2. [7M]

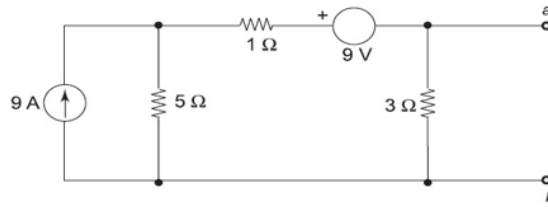


Figure 2

### UNIT – III

3. (a) Draw the neat diagram of DC motor and explain its principle of operation. [7M]
- (b) A DC shunt motor rated 50 kW connected to a 250 V supply is loaded as to draw 200 A when running at a speed of 1250 rpm. Given  $R_a = 0.22 \Omega$ 
  - i) Determine the load torque if the rotational loss (including iron loss) is 600 W.
  - ii) Determine the motor efficiency if the shunt field resistance is 125  $\Omega$ . [7M]
4. (a) Classify types of DC generators and explain in detail the various losses of DC generator. [7M]
- (b) A 4 pole DC generator having wave wound armature has 50 slots and 25 conductors per slot. Find the generated EMF. if it is driven at 25rpm and useful flux per pole in the machine is 0.03 Wb. [7M]

### UNIT – IV

5. (a) Describe the construction and principle of operation of a transformer under no load condition. [7M]
- (b) A 50kVA, 2300/230V, single phase transformer has primary and secondary winding resistance of  $2\Omega$  and  $0.02 \Omega$  respectively. The iron loss is 412W. Calculate the efficiency
  - i) At full load
  - ii) At half full load.
 The load pf is 0.8. [7M]
6. (a) Draw and explain the phasor diagram of a transformer under on load condition. [7M]
- (b) A 30 KVA, 2400/120V, 50Hz transformer has a high voltage winding resistance of  $22\Omega$ . The low voltage winding resistance is  $0.035\Omega$  and leakage reactance is  $0.012\Omega$ . Find the equivalent circuit parameters when referred to the low voltage side. [7M]

### UNIT – V

7. (a) Briefly explain the torque slip characteristics of an Induction motor and mention the maximum torque condition. [7M]
- (b) A 6-pole, 50Hz squirrel cage induction motor runs on load at a shaft speed of 970 rpm. Calculate
  - i) Percentage slip
  - ii) The frequency of the induced current in the rotor. [7M]
8. (a) With a neat diagram explain the constructional features and working of an alternator. [7M]
- (b) A 4-pole, 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 1500, find the EMF generated. [7M]

