INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
B.Tech III Semester End Examinations (Regular) - December, 2017
Regulation: IARE – R16
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common for AE | CE | ME)

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

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) State and illustrate the Ohm's law with an example. What are its limitations and its applications?
   [7M]

   (b) I. Illustrate how the voltage is divided in a series circuit with an example. **[7M]**
   II. Find the equivalent resistance between B and C in the circuit shown in Figure 1.
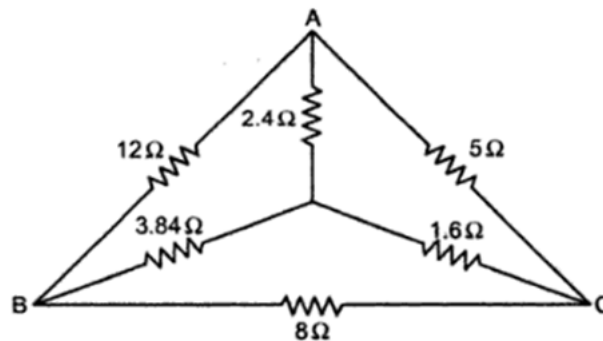

Figure 1

2. (a) Determine currents and voltages in the circuit shown in Figure 2 by applying KVL. **[7M]**

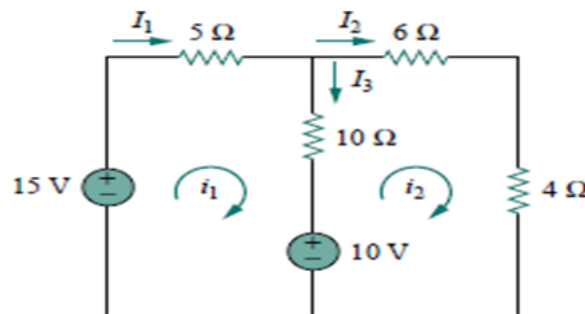Figure 2

(b) Illustrate the principle of operation of permanent magnet moving coil instruments with relevant figure. Mention its advantages and drawbacks. **[7M]**

UNIT – II

3. (a) Explain the different types and its detailed classification of DC generators with relevant figures and equations. **[7M]**

   (b) I. Illustrate the significance of back E.M.F. in a dc motor with relevant figure for the same and give its equivalent circuit. **[7M]**

   II. A 4 pole, DC motor has lap connected armature winding. The flux per pole is 30 mWb. The number of armature conductors is 250. When connected to 230 V DC supply it draws an armature current of 40 A. Calculate the back E.M.F. and the speed with which motor is running. Assume armature resistance is 0.6 Ω.

4. (a) I. Derive the expression for the E.M.F. induced in a DC machine by defining all the terms clearly. **[7M]**

   II. A 4 pole, lap wound, DC generator has a useful flux of 0.07 Wb per pole. Calculate the generated E.M.F. when it is rotated at a speed of 900 rpm with the help of prime mover. Armature consists of 440 number of conductors. Also calculate the generated E.M.F. if lap wound armature is replaced by wave wound armature.

   (b) Illustrate the working principle of a DC motor with relevant figure. Explain the various characteristics of DC motor. **[7M]**

UNIT – III

5. (a) Determine the average and R.M.S values of a sine wave. **[7M]**

   (b) A single phase 2200/250 V, 50 Hz transformer has a net core area of 36 cm^2 and maximum flux density of 6 wb/m^2. Calculate the number of turns in primary and secondary coils. **[7M]**

6. (a) What is an induction motor? Explain the following two types of 3-phase Induction motors with relevant figures. **[7M]**
   i. Squirrel-cage induction motors
   ii. Wound rotor on slip ring induction motor

   (b) I. A 3-phase, 4-pole, 50 Hz induction motor is running at 1455 rpm. Find the slip speed and slip.

   II. A 3-phase, 12-pole alternator is coupled to an engine running at 500 rpm The alternator supplies an induction motor which has a full speed 1455 rpm. Find the slip and the number of poles of the motor. **[7M]**

UNIT – IV

7. (a) Explain the working principle of a full wave bridge rectifier with neat circuit diagram and list its advantages and disadvantages. **[7M]**

   (b) Classify types of diodes? Explain any two. **[7M]**

8. (a) What is a rectifier? Illustrate the operation of half wave rectifier with a neat figure. **[7M]**

   (b) Illustrate what is Zener breakdown. A diode operating at 300°K at a forward voltage of 0.4 V carries a current of 10 mA. When voltage is changed to 0.42 V, the current becomes twice. Calculate the value of reverse saturation current and η for the diode. **[7M]**

UNIT – V

9. (a) Illustrate the input and output characteristics of common emitter configuration with a neat figure. **[7M]**

   (b) I. Draw the circuit symbol for a PNP and NPN transistors. Indicate the reference directions of three currents and polarities of three voltages. **[7M]**

   II. If the base current in the transistor is 20 μA when the emitter current is 6.4 mA, what are the values of α_{dc} and β_{dc}? Also calculate the collector current.

10. (a) In a common base connection if the emitter current is 1 mA and current amplification factor is 0.9. **[7M]**
    i. Determine base current
    ii. Find the total collector current, if the emitter circuit is open the collector current is 50 mA.

    (b) Write a short note on following **[7M]**
    i. Transistor as an amplifier
    ii. Transistor biasing

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