INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Four Year B.Tech III Semester End Examinations (Supplementary) - July, 2018

Regulation: IARE – R16

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Time: 3 Hours   **(Common to AE | ME | CE)**   **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) Classify types of electrical circuit elements and explain.   **[7M]**
   (b) Find the equivalent resistance R_{ab} shown in Figure 1.   **[7M]**
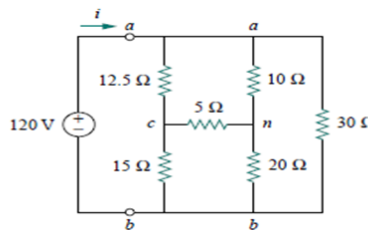

Figure 1

2. (a) What are the essential operating torques in indicating instruments and explain in detail.   **[7M]**
   (b) Determine voltages V_1 and V_2 , power dissipated by 3KΩ , 20 KΩ and power supplied by current source shown in Figure 2.   **[7M]**
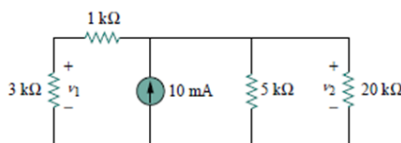

Figure 2

UNIT – II

3. (a) Classify different types of DC motors and explain briefly.   **[7M]**
   (b) A 4.46KW 220V DC shunt motor has an armature resistance of 0.03 ohm and field resistance of 150 ohm. Determine back EMF when efficiency is 85%.   **[7M]**

4. (a) Derive expression for EMF generated in DC generator. **[7M]**

   (b) A DC generator has a generated e.m.f. of 210 V when running at 700 rpm and the flux per pole is 120 mWb. Determine the generated e.m.f. **[7M]**
      i. At 1050 rpm, assuming the flux remains constant
      ii. If the flux is doubled at constant speed
      iii. At a speed of 1155 rpm and a flux of 132 mWb.

UNIT – III

5. (a) What is a transformer? Derive expression for EMF generated in single phase transformer. **[7M]**

   (b) A 50 KVA single phase transformer of 2300/230V has primary and secondary winding resistances of 2 ohm and 0.02 ohm respectively. The iron losses are equal to 412W. Calculate efficiency at half load and full load at 0.8 pf lagging. **[7M]**

6. (a) Define slip? Explain the slip-torque characteristics of three phase induction motor. **[7M]**

   (b) A three phase 50 Hz star connected salient pole alternator has 216 slots with 5 conductors per slot. All the conductors of each phase are connected in series. The winding is full pitched. The flux per pole is 30 mwb and alternator runs at 250 rpm. Determine the phase and line induced emf, assume distribution factor 0.9597. **[7M]**

UNIT – IV

7. (a) What is PN junction diode? Illustrate the operation of PN junction diode with V-I characteristics using relevant figure. **[7M]**

   (b) A 5V stabilized power supply is required to be produced from a 12V DC power supply input source. The maximum power rating P_Z of the zener diode is 2W. Using the zener regulator circuit calculate: **[7M]**
      i. The maximum current flowing through the zener diode,
      ii. The minimum value of the series resistor, R_S
      iii. The load current I_L if a load resistor of 1kΩ is connected across the zener diode
      iv. The zener current I_Z at full load.

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

   (b) A diode operating at 300^0 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 for the diode **[7M]**

UNIT – V

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

   (b) The fixed bias circuit shown in Figure 3 below uses a silicon transistor with $V_{BE} = 0.7V$.
      i. Find the collector current, I_C, and voltage V_{CE}, if β of transistor is 60.
      ii. Find I_C and V_{CE} if β changes to 80. What conclusions may be drawn? **[7M]**

+V$_{CC}$ (9V)

60k
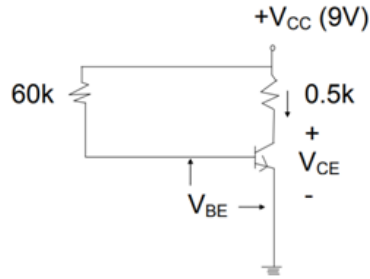
0.5k

+
V$_{CE}$

V$_{BE}$ →

-

Figure 3

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

(b) What is a Junction transistor? Illustrate the physical structure and operation of both the p-n-p and n-p-n transistors with a neat figure. **[7M]**

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