Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 30063

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Second Semester

Mechanical Engineering

BE 3251 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to Aeronautical Engineering/Aerospace Engineering/Automobile Engineering/Biomedical Engineering/Computer Science and Engineering/Computer and Communication Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Materials Science and Engineering/Mechanical Engineering (Sandwich)/Medical Electronics/Production Engineering/Safety and Fire Engineering/Artificial Intelligence and Data Science/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State ohm's law and mention its limitations.
2. An Electric iron is rated 1000W, 240V. Find the current drawn and resistance of the heating element.
3. "DC series motor should not be started at No Load" - Specify the reason.
4. Calculate the stator rotating magnetic field speed and the % slip of a 4 pole, 400V, 50Hz induction motor running at 1440 rpm at full load.
5. List the applications of Zener diode.
6. Define latching and holding currents of a SCR.
7. Calculate the number of bits affected if the data send speed is 1Mbps with the noise of 1/1000 second.

8. Explain about SOP and POS form.

9. A wattmeter reads 25.34 watts. The absolute error in the measurement is –0.11 watt. Determine the true value of power.

10. Write the basic functional elements of data acquisition system(DAS)

PART B — (5 × 13 = 65 marks)

11. (a) (i) Find the current in the 3Ω resistor in the network shown in fig. 11(a)(i) (6)

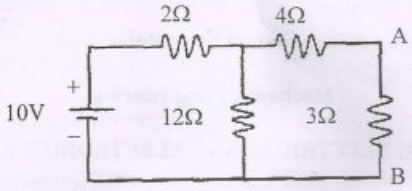

Fig. 11(a)(i)

(ii) A sinusoidal voltage V = 200 sin 314t is applied to a 10 Ω resistor. Find (1) frequency (2) rms voltage, (3) rms current and (4) power dissipated as heat. (7)

Or

(b) (i) Using Maxwell's mesh current analysis determines the magnitude current I_1 and I_2 for the network shown in fig. 11(b)(i) (6)

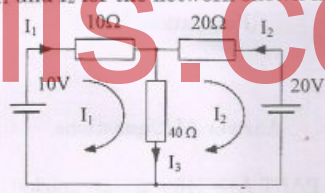

Fig. 11(b)(i)

(ii) Find the node voltage at points A and B in the network shown in Fig. 11(b)(ii) (7)

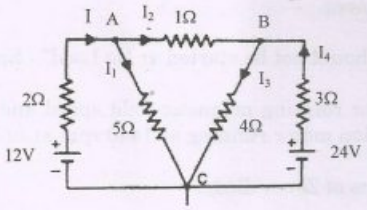

Fig. 11(b)(ii)

12. (a) (i) Assuming necessary parameters, derive the induced E.M.F. equation of a DC generator. (6)

(ii) Explain the armature resistance speed control of DC shunt motor with a diagram. (7)

Or

(b) (i) A transformer has 600 turns of the primary winding and 20 turns of the secondary winding. Determine (1) the secondary voltage if the primary voltage is 140 V with the secondary open. (2) the primary current if the secondary current is 90 A. (7)

(ii) Compare squirrel cage and slip ring induction motors in detail. (6)

13. (a) Explain the construction, working and V-I characteristic of a PN junction diode. (13)

Or

(b) Design a circuit to convert an AC voltage into a DC voltage with a diode full wave bridge circuit and draw the resultant rectified wave form. (13)

14. (a) Explain different error detection technique and error correction codes in detail. (13)

Or

(b) (i) Differentiate SOP and POS in Digital Logic. (7)

(ii) Minimize the expression

$Y = AB'C + A'B'C + A'BC + AB'C' + A'B'C'$ Using K-Map (6)

15. (a) (i) Explain the two wattmeter method of three phase power measurement with a sketch. (7)

(ii) Describe working of a PMMC meter and its use in measurements. (6)

Or

(b) (i) Describe the functional components of DSO with a block diagram. (7)

(ii) Compare current transformer with potential transformers. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Explain the working of a single phase induction type energy meter with a sketch and prove that disc revolution is proportional to energy consumption. (15)

Or

(b) Sketch the blocks of a data acquisition system and explain its functional element and its application in various process control industries. (15)