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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 Design/Computer Science and Engineering/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer Science and Engineering (Cyber Security)/Computer Science and Engineering (Data Science)/Computer and Communication Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Materials Science and Engineering/Mechanical Engineering (Sandwich)/Mechanical Engineering (Specialised in Automobile)/Mechanical Engineering (Specialised in Smart Manufacturing)/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 3 ohm resistor in the network shown in fig. 11(a) (6)
(i) [Figure 11(a)(i): a 10 V source in series with a 2 ohm resistor feeds a node; a 12 ohm resistor connects this node to the return line; a 4 ohm resistor runs from this node to terminal A; the 3 ohm resistor is connected between terminals A and B, B being on the return line]
- (ii) A sinusoidal voltage $V = 200 \sin 314t$ is applied to a 10 ohm resistor. (7)
Find (1) frequency (2) rms voltage, (3) rms current and (4) power dissipated as heat.

Or

- (b) (i) Using Maxwell's mesh current analysis determines the magnitude current (6)
I1 and I2 for the network shown in fig. 11(b)(i) [Figure 11(b)(i): two-mesh circuit; left mesh has a 10 V source and a 10 ohm resistor; right mesh has a 20 V source and a 20 ohm resistor; a 40 ohm resistor carrying I3 is the shared middle branch; mesh currents I1 and I2]
- (ii) Find the node voltage at points A and B in the network shown in Fig. (7)
11(b)(ii) [Figure 11(b)(ii): node A connects through 2 ohm and a 12 V source to node C, through a 5 ohm resistor to node C, and through a 1 ohm resistor to node B; node B connects through a 4 ohm resistor to node C and through 3 ohm and a 24 V source to node C; branch currents I, I1, I2, I3, I4 marked]
12. (a) (i) Assuming necessary parameters, derive the induced E.M.F. equation of a (6)
DC generator.
- (ii) Explain the armature resistance speed control of DC shunt motor with a (7)
diagram.

Or

- (b) (i) A transformer has 600 turns of the primary winding and 20 turns of the (7)
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.
- (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.

Or

- (b) Design a circuit to convert an AC voltage into a DC voltage with a diode full (7)
wave bridge circuit and draw the resultant rectified wave form.
14. (a) Explain different error detection technique and error correction codes in detail.

Or

- (b) (i) Differentiate SOP and POS in Digital Logic. (7)
- (ii) Minimize the expression $Y = AB'C + A'B'C + A'BC + AB'C' + A'B'C'$ (6)
Using K-Map

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