



42044

Library
Brainware University
398, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(RA)-2023

Course Name – Industrial Electronics for Robotics

Course Code - PEC-ECR602B

(Semester VI)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify the power diode.
 - a) Low-power signal diode
 - b) High-current semiconductor device
 - c) Light emitting device
 - d) Switching transistor
- (ii) Identify the term related to diode turn-off behavior.
 - a) Forward voltage
 - b) Reverse recovery time
 - c) Power dissipation
 - d) Surge current
- (iii) Indicate the switching characteristic of a power diode.
 - a) Linear conduction
 - b) Instantaneous switching
 - c) Finite turn-on and turn-off time
 - d) No switching delay
- (iv) Interpret the need for fast recovery diodes.
 - a) Low voltage operation
 - b) High frequency applications
 - c) Low current circuits
 - d) DC supplies only
- (v) Indicate series operation of power diodes.
 - a) Increase current rating
 - b) Increase voltage rating
 - c) Reduce power loss
 - d) Improve efficiency
- (vi) Identify the structure used in vertical power transistor.
 - a) Lateral structure
 - b) Vertical structure
 - c) Planar structure
 - d) Surface structure
- (vii) Define thermal resistance.
 - a) Ability to conduct heat
 - b) Opposition to heat flow
 - c) Heat storage capacity
 - d) Electrical resistance
- (viii) Identify the unit of thermal resistance.
 - a) W/°C
 - b) °C/W
 - c) J/°C
 - d) W/m
- (ix) List the component used to improve heat dissipation.

- a) Transformer
- b) Heat sink
- c) Fuse
- d) Snubber
- (x) Define Switch Mode Power Supply.
 - a) Linear regulated supply
 - b) High-frequency switching power supply
 - c) Unregulated DC source
 - d) Battery operated supply
- (xi) Identify the main switching element used in SMPS.
 - a) Diode
 - b) Transformer
 - c) BJT or MOSFET
 - d) Resistor
- (xii) Recall the primary control technique used in SMPS.
 - a) Amplitude modulation
 - b) Frequency modulation
 - c) Phase modulation
 - d) Pulse Width Modulation
- (xiii) Interpret the function of feedback in switching regulators.
 - a) Increase output voltage
 - b) Stabilize output voltage
 - c) Reduce switching noise
 - d) Increase switching speed
- (xiv) Identify a disadvantage of linear regulators.
 - a) High efficiency
 - b) Low heat loss
 - c) High power dissipation
 - d) Compact size
- (xv) Identify the rectifier stage in SMPS block diagram.
 - a) Converts DC to AC
 - b) Converts AC to DC
 - c) Stores energy
 - d) Controls duty cycle

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Explain the concept of transient protection using MOV and snubber circuits. (3)
3. Describe natural and forced commutation of SCR. (3)
4. Apply the concept of ripple factor, PIV, and efficiency in rectifier selection. (3)
5. Apply the comparison between switching regulator and linear regulator for power supply selection. (3)
6. Analyze the impact of reverse recovery time on the switching performance of a power diode operating at high frequency. (3)

OR

Analyze the reasons for unequal voltage sharing when power diodes are connected in series and suggest how it affects diode reliability. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Analyze the operation of a single phase full wave controlled rectifier with inductive load and freewheeling diode. (5)
8. Analyze the principle of operation of a Switch Mode Power Supply (SMPS) with the help of its block diagram and explain how regulation is achieved. (5)
9. Explain the principle of operation of a single-phase full-wave controlled rectifier with resistive and inductive loads. (5)
10. Apply PWM control technique to regulate the output voltage of an SMPS. (5)
11. An SCR has a specified turn-off time of 45 μ s. In a forced commutation circuit, the reverse bias is applied for 38 μ s. Determine whether successful commutation will occur. (5)
12. Evaluate the performance of fast recovery diodes compared to general-purpose power diodes. (5)

OR

Evaluate the role of thermal characteristics in determining the reliability of power diodes. (5)