

**B.Sc. PHYSICS
FIFTH SEMESTER
BASIC ELECTRONICS
BSP – 502**

[USE OMR FOR OBJECTIVE PART]

2024/11

**SET
A**

Full Marks: 35

Duration: 1:30 hrs.

(Objective)

Marks: 10

Time: 15 mins.

$1 \times 10 = 10$

Choose the correct answer from the following:

1. Which of the following phenomena is responsible for the movement of charge carriers in a semiconductor due to a concentration gradient
 - a. Drift
 - b. Diffusion
 - c. Recombination
 - d. Tunneling
2. In the formation of a PN junction diode, the barrier potential is created due to:
 - a. Excess electrons
 - b. Charge carrier recombination at the junction
 - c. External voltage
 - d. Thermal excitation
3. Which of the following is the main characteristic of an ideal diode?
 - a. Infinite resistance in both forward and reverse bias
 - b. Zero resistance in forward bias, infinite resistance in reverse bias
 - c. Infinite resistance in forward bias, zero resistance in reverse bias
 - d. Equal resistance in both forward and reverse bias
4. What is the main function of a diode in a rectifier circuit?
 - a. To amplify signals
 - b. To convert AC to DC
 - c. To regulate voltage
 - d. To store energy
5. In which transistor configuration is the output voltage taken across the collector and emitter terminals?
 - a. Common Base (CB)
 - b. Common Collector (CC)
 - c. Common Emitter (CE)
 - d. None of the mentioned
6. What does the Q-point (Quiescent point) in a transistor represent?
 - a. The maximum voltage point
 - b. The operating point in the active region
 - c. The point where the transistor is cut off
 - d. The point where the transistor is saturated
7. Which of the following is the correct relation between α (alpha) and β (beta) in a transistor?
 - a. $\beta = \alpha / (1 - \alpha)$
 - b. $\beta = \alpha / (1 + \alpha)$
 - c. $\beta = 1 + \alpha$
 - d. $\beta = \alpha + 1$

8. What is the binary equivalent of the decimal number 25?
- | | |
|----------|----------|
| a. 11001 | b. 10101 |
| c. 11100 | d. 10011 |
9. What is the 2's complement of the binary number 1010?
- | | |
|---------|---------|
| a. 0110 | b. 0101 |
| c. 1011 | d. 0110 |
10. In Boolean algebra, the expression $A + A'$ simplifies to:
- | | |
|---------|--------|
| a. A' | b. A |
| c. 1 | d. 0 |

-- --- --

(Descriptive)

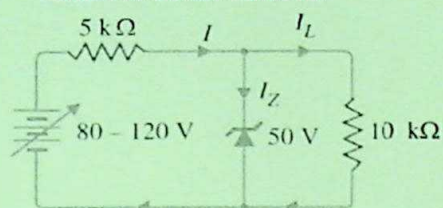
Time: 1 hr. 15 mins.

Marks: 25

[Answer question no.1 & any two (2) from the rest]

1. For the circuit shown below, find the maximum and the minimum values of Zener current.

5



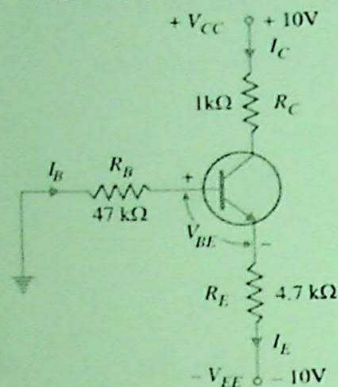
2. a. Draw the circuit diagram of a full wave bridge rectifier and explain its operation in detail.
 b. Derive and calculate the efficiency of a full wave bridge rectifier.
 c. Define ripple factor and compare it for half wave and full wave rectifiers.
3. a. Draw the circuit diagrams of both Common Base and Common Emitter configurations of a transistor.
 b. Define the current amplification factor for both Common Base (α) and Common Emitter (β) configurations and find the relation between them.
 c. Derive the expression for the collector current (I_c) in each configuration in terms of the emitter current or base current and the respective current amplification factor.
4. a. Define the DC load line of a transistor and explain the Q-point. Draw a graphical representation of the DC load line on the output characteristics of a CE transistor and mark the Q-point.

4+3+3
=10

2+4+4
=10

3+7=10

- b. Draw the DC load line and find the Q-point. Given $\beta=100$ and $V_{BE}=0.7\text{ V}$.



5. a. Determine the decimal representation of the following binary numbers: (i) 1101 (ii) 10101 (iii) 100110 (iv) 1110101
- b. Draw the circuit diagrams for a two-input transistor OR gate and a two-input transistor AND gate. Explain the operation of each gate for all possible combinations of inputs (00, 01, 10, 11).

4+6=10

== *** ==