

(4)

8. (a) Explain the carrier generation mechanism in a semiconductor. What is the carrier generation rate? How is the absorption co-efficient defined for a semiconductor? Give its significance. (8)
- (b) Why is a P-N junction required for the operation of a solar cell? (2)
- (c) Briefly explain different types of losses in a solar cell. (4)

UNIT - V

9. (a) What is a perovskite? Give important properties of perovskites. (4)
- (b) Explain the working of a perovskite solar cell with appropriate diagram. (4)
- (c) What are the problems associated with perovskite solar cell? How does those problems can be eliminated? (6)
10. (a) Give four synthesis method for the fabrication of perovskite films and briefly explain them. (8)
- (b) What is the function of electron transport layer (ETL) and hole transport layer (HTL) in a perovskite solar cell (PSCs). Draw schematics of n-i-p and p-i-n architecture of PSCs. (6)

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2022/ODD/08/21/PHY-504(B)/040

PG ODD SEMESTER EXAMINATION, 2022**PHYSICS**

1st Semester

Course No. : PHYSEC - 504 (B)

(Learning Electronics through software)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer any five questions, taking one from each unit)

UNIT - I

1. (a) Draw the block diagram of a regulated power supply and explain the functions of each part. (4)
- (b) Explain the action of a zener diode as a voltage regulator. (4)
- (c) Explain α and β of a transistor and how they are related to each other. (4)
- (d) What do you mean by “pinch-off voltage” of a JFET? (2)

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(2)

2. (a) Draw and explain the circuit diagram of a bridge rectifier. (4)
- (b) Discuss h-parameters. (4)
- (c) Explain the action of a transistor as an amplifier from its output characteristic curve. (6)

UNIT - II

3. (a) Draw the circuit diagram of a RC coupled amplifier and explain the role of coupling capacitor, by-pass capacitor and potential divider biasing. (6)
- (b) Draw the frequency response curve of a RC coupled amplifier and explain the cause of the drop in gain at the low and high frequency. Discuss the lower and upper cut-off frequency and band-width of a RC coupled amplifier. (8)
4. (a) Discuss with the help of a circuit diagram an inverting amplifier with an opamp. Explain the concept of virtual ground. (6)
- (b) Draw the circuit diagram of a phase shift oscillator with an op-amp. Write down the frequency of oscillation and condition of sustained oscillation. (4)
- (c) Explain slew-rate and power bandwidth of an op-amp. (4)

(3)

UNIT - III

5. (a) Explain how can you realise AND, OR and NOT gate using diode and transistor. (6)
- (b) Draw and explain the circuit diagram of a 4-bit adder. (4)
- (c) Draw the circuit diagram of a half subtractor and write down its truth table. (4)
6. (a) Explain the action of 4:1 MUX with the help of logic gates. (6)
- (b) Explain RS latch using both NOR and NAND gates. (4)
- (c) Explain JK-master slave flip flop. What do you mean by toggling? (4)

UNIT - IV

7. (a) Explain how photo-voltage is generated across a P-N junction diode when it is illuminated by light. Draw minority and majority carrier profile for the illuminated junction and briefly explain about their behaviour. (5+3=8)
- (b) What is light generated current? Define I_{sc} , V_{oc} , FF and efficiency(η) of a solar cell. (6)

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