

**2020**

**ELECTRONICS — GENERAL**

**Paper : DSE-A-2**

**(Photonic Devices and Power Electronics)**

**Full Marks : 50**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Day 3**

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any ten** questions :

1×10

- (a) An SCR can be turned off by
- (i) reducing gate voltage to zero
  - (ii) reverse biasing the gate
  - (iii) reducing anode voltage to zero
  - (iv) None of these.
- (b) PIN diode consists of
- (i) 2 operating regions
  - (ii) 5 operating regions
  - (iii) 3 operating regions
  - (iv) 4 operating regions.
- (c) Which of the following loss occurs inside the fibre?
- (i) scattering
  - (ii) radiative loss
  - (iii) attenuation
  - (iv) absorption.
- (d) If the gate current is increased, the forward breakover voltage of an SCR
- (i) increases
  - (ii) decreases
  - (iii) remains same
  - (iv) None of these.
- (e) A solar cell operates on the principle of
- (i) recombination
  - (ii) diffusion
  - (iii) thermoelectric effect
  - (iv) photovoltaic effect.
- (f) The optical property of liquid crystal depends on the direction of
- (i) solid
  - (ii) air
  - (iii) light
  - (iv) water.

**Please Turn Over**

- (g) Which of the following materials cannot be used as a solar cell material?  
(i) Si                      (ii) GaAs                      (iii) PbS                      (iv) CdS.
- (h) The structure of IGBT is topologically the same as a  
(i) MOSFET                      (ii) BJT  
(iii) MOS gate thyristor                      (iv) thyristor.
- (i) Which of the following device is a power electronic device?  
(i) Laser                      (ii) Photodiode                      (iii) Diac                      (iv) LED.
- (j) TRIAC is used to control  
(i) load                      (ii) voltage                      (iii) power                      (iv) current.
- (k) In solar cell,  
(i) light energy is converted into electrical energy  
(ii) electrical energy is converted into light energy  
(iii) heat energy is converted into light energy  
(iv) heat energy is converted into electrical energy.
- (l) A thyristor without the gate terminal is called  
(i) Schokley diode      (ii) inverter                      (iii) SCR                      (iv) triac.
2. (a) What is the condition for amplification of a semiconductor laser?  
(b) What is optical cavity?  
(c) Give few desired properties of a good laser. 3+3+4
3. (a) Describe the structure of Liquid Crystal Display (LCD).  
(b) Give few advantages of LED over CRT display.  
(c) Sketch the cross-section of a typical Solar Cell and draw typical I-V characteristic curve of a solar cell. 4+2+4
4. (a) Explain the term 'Numerical Aperture' in optical fibre.  
(b) Draw the structure of a circular optical fibre wave guide. Which modes are allowed in this type of wave guide?  
(c) Draw the basic structure of a triac and explain its I-V characteristics. 2+(2+2)+4
5. (a) Sketch the construction of an SCR and explain its operation.  
(b) Why is SCR called controlled rectifier?  
(c) How many types of liquid crystals are there? (2+4)+2+2

6. (a) Write a short note on basic structure and operation of IGBT.  
(b) Why is heterostructure required for optical devices?  
(c) What is the term SOA imply? (2+3)+3+2
7. (a) Explain the operation of p-i-n photodiode.  
(b) Describe Quantum Efficiency of a p-i-n diode.  
(c) How is LED different from photodiode? 4+3+3
8. (a) For a step index fibre, the normalized frequency ( $\gamma$ ) is 28 at a wavelength of 1400 nm. Determine the Numerical Aperture if the core radius is 24  $\mu\text{m}$ .  
(b) Schematically describe the operation and construction of a laser diode.  
(c) Give an example of indirect band gap material. 4+(2+3)+1
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