Ex/PG/ETCE/T/111E/16/2017

M.E.T.C.E Examination 2017

(1st year, 1st Semester)

OPTOELECTRONIC DEVICES

The figures in margin indicate full marks. All the questions must be answered in one place. The answers should be precise.

Answer any five questions and carry equal marks

Full Marks:100 Time: Three hours

Q.1 (a) Discuss the Einstein Coefficients. How are they related to the LASER Operation? 8

(b) Discuss the following 12

(i) Luminous flux,
(ii) Population of inversion in laser diode,
(iii) Gain and response time of photo detector.

Q. 2 (a) Explain the operation of photoconductive cell . Give the spectral response of the human eye. 8

(b) What are the limitations of p-n photodiode ? What is the concept of threshold of semiconductor LASER? 8

(c) Give some typical medical and mechanical applications of LASER. 4

Q.3 (a) Discuss the following parameters of photo detector and give their significance :

(i)Noise Equivalent power,
(ii) Responsivity,
(iii) Quantum Yield,

12

(b) Describe the origin of different noise mechanisms in a photo detector.
8

Q.4 (a) Describe the following devices in detail

(i) Phototransistor,
(ii) Avalanche photo diode.

Compare them in terms of their performance , operation and Construction. 14

(b) Give the sketch of mesa etched pin photodiode for (i) top illumination (ii) back illumination. 6

Q.5 (a) Describe the operation of Solar Cell. Also provide the equivalent circuit of Solar Cell.

10

(b) Discuss the following
(i) Open circuit voltage and short circuit current 6
(ii) Effect of temperature on solar cell performance

(c) Differentiate between photodiode and solar cell 4

Q.6 .(a) Discuss the following
(i) Double and single Hetro structure Lasers 15
(ii)Laser diode and its application in communication,
(iii)optically coupled isolator .

(b)Discuss the characteristics of Silicon photodiode. 5

Q.7 (a) Describe the construction and operation of semiconductor LED. 10

(b) Compare the energy and momentum of photon and phonon . 6

(c) What are the semiconducting materials required for (i)green and(ii) blue light . List one infrared laser. 4

Q.8 Write the short note on any four 4x5=20

(i) Hetero structure Laser,
(ii) APD,
(iii) Photodiode,
(iv) Comparison of LASER and LED diodes,
(v) Photovoltaics.