

Total No. of Questions : 12]

SEAT No. :

P3169

[Total No. of Pages : 3

[4859]-126

B.E. (Electronics)

OPTICAL AND MICROWAVE COMMUNICATION

(2008 Pattern) (Elective - III) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 questions from Section - I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use electronic pocket calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) Draw block diagram of optical fiber communication system. Explain in detail key elements of optical fiber systems. [6]
- b) In a multimode step index fiber, following parameters were measured : [4]
- i) No. of modes passing at an operating wavelength of 1300 nm are 1000.
 - ii) Refractive index of core : 1.50
 - iii) Refractive index of cladding : 1.48
- Determine core diameter of above step index fiber.
- c) Explain the following types of fibers with their characteristics. [6]
- i) Multimode step index fiber.
 - ii) Multimode graded index fiber.
 - iii) Single mode step index fiber.

OR

- Q2)** a) Draw neat construction of single mode Laser and explain it. [8]
- b) Explain in detail external type of modulator's for LASER with diagram. [8]

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- Q3)** a) What is dispersion? Explain intermodal dispersion and intramodal dispersion. [8]
b) What are the different types of optical amplifiers? Explain it in brief. [8]

OR

- Q4)** a) State the functions of passive optical couplers. Draw and explain 2×2 Fiber coupler. [8]
b) Write a short note on SONET/SDH networks. [8]

- Q5)** Write short notes on : [18]
a) Interferometric method of measurement of length.
b) Laser instruments for surgery.
c) Laser Welding.

OR

- Q6)** a) Explain how LASER can be used in trimming of resistor. [6]
b) Draw set up for liquid level measurement and explain it. Also explain the structure of optical sensor used in this application. [8]
c) Explain Pulse-Echo technique in brief. [4]

SECTION - II

- Q7)** a) What do you understand by waveguide modes? What are dominant modes? [8]
b) Differentiate between group velocity and phase velocity as applied to waveguides. [4]
c) An air filled rectangular waveguide has dimension of $6 \text{ cm} \times 4 \text{ cm}$. The signal frequency is 3 GHz. Compute the following for TE_{10} mode. [6]
i) Cut off frequency.
ii) Wavelength in the waveguide.
iii) Wave impedance in the waveguide.

OR

- Q8)** a) Write short note on following : [8]
i) Microwave isolator.
ii) S Matrix and its properties.
b) Explain the construction and working of gyrator based on Faraday's rotation principle. [6]
c) What is hybrid E-H plane Tee referred to as a Magic Tee? [4]

- Q9)** a) Compare two cavity Klystron and reflex Klystron with relevant sketches. [8]
b) What do you mean by cross field device? Explain the phase focussing effect in magnetron. [8]

OR

- Q10)** a) Draw the construction of TWT and explain its operation. State the applications of TWT. [8]
b) A reflex Klystron operates under the following conditions : [8]

$$V_o = 600\text{V}, L = 1\text{mm}, R_{sh} = 15\text{ k}\Omega, f_r = 9\text{GHz}, \frac{e}{m} = 1.759 \times 10^{11}.$$

The tube is oscillating at f_r at the peak of the $n = 2$ mode $1\frac{3}{4}$ mode.

Assume that the transit time through the gap and beam loading can be neglected.

- i) Find the value of the repeller voltage.
- ii) Find the direct current necessary to give a microwave gap voltage of 200V.
- iii) What is the electronic efficiency under this condition?

- Q11)** a) Explain the various modes of operation of Gunn diode. [8]
b) Explain principle of operation, I-V characteristics and equivalent circuit of microwave tunnel diode. [8]

OR

- Q12)** a) Describe the amplification mechanism of parametric amplifier with the help of equivalent circuit. [8]
b) Write short note on following : [8]
i) Schottky diode.
ii) PIN diode.

