Total No. of Questions : 12]

SEAT No. :

P3694

[Total No. of Pages :4

[4759] - 125

B.E. (Electronics)

OPTICAL AND MICROWAVE COMMUNICATION

(Semester - II) (Elective - III) (2008 Pattern) (404209)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain following types of fibers with their characteristics. **[6]**

i) Single mode step index fiber

ii) Multimode step index fiber

iii) Multimode graded index fiber

b) Define fiber splicing. Explain different types of fiber splicing. **[6]**

c) An optical fiber has core refractive index of 1.5 and cladding refractive index 1.45. Calculate the following: **[6]**

i) Critical angle

ii) Numerical aperture

iii) Acceptance angle

OR

Q2) a) What is LASER? Explain the working of LASER. Compare LASER with LED. **[8]**

b) Explain how light is propagated within a fiber. Define the following terms with respect to an optical fiber. **[6]**

i) Acceptance cone

ii) Numerical aperture

P.T.O.

c) Explain the following characteristics of photo detectors. **[4]**

i) Quantum efficiency

ii) Response time

Q3) a) A laboratory demonstration setup has a continuous 12km long optical fiber link that has a loss of 1.5dB/km. **[8]**

i) Compute the minimum optical power level in dB that must be launched into fiber to maintain an optical power level of 0.3W at the receiving end.

ii) Calculate the required input power in dB if the fiber has a loss of 2.5dB/km.

b) Draw a neat diagram of a WDM system and explain its working along with components. **[8]**

OR

Q4) a) What is dispersion? Explain intermodal dispersion and intramodal dispersion. **[8]**

b) Explain the mechanism of amplification in an EDFA with a suitable energy level diagram. **[8]**

Q5) a) Explain the interferometric method of distance/length measurement based on Michelson Interferometer. **[8]**

b) Explain the setup for liquid level measurement with the help of a neat diagram. Also explain the structure of optical sensor used in this application. **[8]**

OR

Q6) Write short notes on: **[16]**

i) LASER applications in medicine.

ii) Measurement of pressure and temperature using optical sensors.

SECTION - II

Q7) a) Explain the following parameters of a directional coupler. **[8]**

i) Coupling factor

ii) Directivity

iii) Isolation

iv) Insertion loss

b) Determine the cutoff wavelength for the dominant mode in a rectangular waveguide of breadth 10cm. For a 2.5 GHz signal propagated in this waveguide in dominant mode; calculate guide wavelength, group velocity, phase velocity and wave impedance. **[10]**

OR

Q8) a) Explain the construction and working of gyrator based on Faraday's rotation principle. **[6]**

b) State and explain the properties of scattering matrix. **[6]**

c) A power source of 90W is connected to the input port of a directional coupler with coupling factor 20dB and directivity 35dB. Neglecting the insertion loss, find the powers at coupled, isolated and output ports. **[6]**

Q9) a) Explain the limitations of conventional tubes at microwave frequencies. **[8]**

b) Draw schematic structure of two cavity klystron amplifier. Explain its working principle and operation. **[8]**

OR

Q10)a) Draw the structure of a travelling wave tube and explain its working. **[8]**

b) Draw schematic structure of reflex klystron. Explain its working principle and operation. **[8]**

Q11)a) Explain power frequency limitations of microwave BJT. **[8]**

b) Draw and explain the construction of a microwave BJT. Also explain different types of surface geometries used in it. **[8]**

OR

Q12)Explain the following microwave solid-state devices with their applications.**[16]**

a) PIN diode

b) Tunnel diode

c) Varactor diode

d) Gunn diode