Con. 3152-06.   (REVISED COURSE)   TV - 8478

(3 Hours)   [Total Marks : 100

N. B. : (1) Question no. **1** is **compulsory**.
  (2) Attempt any **four** questions from the remaining **six** questions.
  (3) Figures to the **right** indicate **full** marks.

1. Answer any **four** :—
  (a) Why TM_{01} or TM_{10} mode is not possible in rectangular waveguide.   5
  (b) State and explain the symmetry property of S-matrix.   5
  (c) Draw the refractive index profile of step-index and graded index fiber.   5
  (d) What is cut off wavelength as applied to optical fibres ?   5
  (e) Stimulated emission in Lasers.   5

2. (a) Explain in brief the limitations of conventional vacuum tubes at micro wave frequencies.   8
  (b) Explain the velocity modulation and bunching process in Reflex klystron, with necessary expressions.   12

3. (a) An air filled rectangular waveguide of inside dimension a = 8 cm and b = 4 cm, operates in the dominant TE_{10} mode.   10
    Find—
    (i) the cutoff frequency.
    (ii) the group velocity of the waveguide at a frequency of 3.75 GHz.
    (iii) the guided wavelength at the same frequency.
  (b) Discuss the methods of exciting TE_{10} and TE_{20} modes in a recatangular waveguide.   10

4. (a) Define coupling factor and directivity of a directional coupler.   5
  (b) What are crossed field devices ? Explain the working principle in brief of any crossed field device.   5
  (c) Obtain the S - matrix for magic Tee and with the help of it, explain the working of the magic Tee.   5
  (d) Describe the operation of IMPATT divide.   5

5. (a) What is dispersion in optical fibers ? How does it affect the performance of the fiber optic link ?   4
  (b) A multi–mode guided index fiter exhibits total pulse broadening of 0.2 us over a distance of 30 km.   6
    Find—
    (i) the maximum possible bandwidth on the link assuming no inter–symbol interference.
    (ii) the pulse dispresion per unit length.
    (iii) the bandwidth length product for the fiber.
  (c) G. Compare the dispersion in graded index fiber and step index fiber.   5
  (d) Explain any one method of measuring dispersion in optical fiber.   5

6. (a) What is a heterofunction structure ? How is it better than a homojunction ?   5
  (b) Distinguish between spontaneous emission and stimulated emission. How stimulated emission is achieved in LASER ?   10
  (c) What are direct bandgap and indirect bandgap semiconductors ?   5

7. (a) With the help of a neat diagram, explain the modified chemical vapour deposition (MCVD) technique of fabricating an optical fiber.   10
  (b) For a photodiode, explain the terms (i) Responsivity (ii) quantum efficiency (iii) Dark Current (iv) Transit – time.   4
  (c) Compare p-i-n diode and p-n photodiode.   6