

17656**21415****3 Hours / 100 Marks**

Seat No.

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- Instructions :** (1) All Questions are *compulsory*.
 (2) Illustrate your answers with neat sketches wherever necessary.
 (3) Figures to the right indicate full marks.
 (4) Assume suitable data, if necessary.
 (5) Use of Non-Programmable Electronic Pocket Calculator is permissible.
 (6) Preferably, write the answers in sequential order.

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| 1. [A] Attempt any THREE : | 12 |
| <ul style="list-style-type: none"> (a) State two advantages and two applications of circular waveguide. (b) Draw labelled sketch of Reflex Klystron. List its two application. (c) Define the term antenna scanning. State its types. Explain any one type of antenna scanning. (d) Define the term 'orbit' w.r.t. satellite. List different types of orbits of satellite. | |
| [B] Attempt any ONE : | 6 |
| <ul style="list-style-type: none"> (a) Draw field pattern of $TE_{1,0}$ mode in rectangular waveguide. (b) Draw a neat constructional diagram of IMPATT diode. Describe its working. | |
| 2. Attempt any FOUR : | 16 |
| <ul style="list-style-type: none"> (a) Compare waveguide and two wire transmission line. (Eight points) (b) Write out specifications of each of the followings : <ul style="list-style-type: none"> (i) Two cavity Klystron (ii) Magnetron (c) List different display methods used in radar. Explain any one display method. (d) State four advantages of fiber optic communications. (e) Classify fiber optic cable on the basis of (i) modes (ii) refractive index profile. (f) State reason for difference in uplink and downlink frequency in satellite communication. | |

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17656

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- 3. Attempt any FOUR :** **16**
- A rectangular waveguide is 5 cm by 2.5 cm. Calculate the cut-off frequency of dominant mode.
 - With neat sketch, describe operation of tunnel diode.
 - State four factors influencing maximum range of radar.
 - State four advantages of Geostationary satellites.
 - Differentiate satellite communication and fiber optic communication w.r.t. (i) Frequency range (ii) Electromagnetic interference (iii) Application (iv) Limitations.
- 4. [A] Attempt any THREE :** **12**
- State function of following waveguide components :
 - Isolator
 - Circulator
 - Draw constructional diagram of PIN diode and describe its working.
 - Explain Radar Beacon. State its two applications.
 - Define following terms w.r.t. satellite :
 - Look angle
 - Footprint
 - Station keeping
 - Elevation angle
- [B] Attempt any ONE :** **6**
- A silica optical fiber with core diameter large enough to be considered by ray theory analysis has core refractive index of 1.50 and cladding refractive index of 1.47. Calculate (i) Critical angle (ii) NA of fiber (iii) Acceptance angle in air for fiber.
 - Derive Radar range equation for noise free atmosphere.
- 5. Attempt any FOUR :** **16**
- Draw and describe the working of E-plane tee.
 - Draw constructional diagram of two cavity Klystron. List its two applications.
 - Draw block diagram of OTDR and explain its working.
 - Draw block diagram of satellite subsystem.
 - Calculate critical angle of incidence between two substances with different refractive indices $n_1 = 1.4$ and $n_2 = 1.36$.
 - State splicing techniques used for optical fiber. Explain any one in detail.
- 6. Attempt any FOUR :** **16**
- Explain the concept of dominant mode in waveguide.
 - Compare LED and LASER. (8 points)
 - What is intermodal and intramodal dispersion ?
 - Compare step index and graded index fiber. (Any four points)
 - Write uplink and downlink frequencies for C-band, X-band, Ku band and Ka band.