3 Hours / 100 Marks   Seat No. ☐☐☐☐☐☐☐☐

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.

Marks

1.   (A)   Attempt any THREE :   **12**

(a)   Define the term w.r.t. wave guide (a) group velocity, (b) phase velocity.

(b)   With neat sketch, describe operations of tunnel diode.

(c)   List different display methods used in Radar. Explain any one display method.

(d)   Why is the uplink is more than downlink frequency in satellite communication ?

(B)   Attempt any ONE :   **06**

(a)   Describe rectangular waveguide in TE and TM mode.

(b)   Sketch the construction of PIN diode and write its operation.

2.   **Attempt any FOUR :**   **16**

    (a)   Draw the construction of microwave circulator and isolator. List applications

        of each (any two).

    (b)   Draw and explain the working of two cavity klystron amplifier.

    (c)   Describe any one antenna used in RADAR.

    (d)   Define with respect to fiber optic cable (i) Numerical Aperture,

        (ii) Acceptance angle.

    (e)   Describe losses in optical fiber.

    (f)   Explain advantages of Satellite communication (4 points).

3.   **Attempt any FOUR :**   **16**

    (a)   A rectangular waveguide is 5 cm × 2.5 cm. Calculate cutoff freq. of dominant

        mode.

    (b)   Describe the bunching process in Magnetron with neat diagram.

    (c)   How doppler effect can be used to measure speed ?

    (d)   Illustrate how telemetry tracking and command system is used in satellite.

    (e)   Draw frequency spectrum of optical communication with band name and its

        range.

4. **(A)   Attempt any THREE :**   **12**

   (a)   Write uplink and downlink frequencies for C-Band, X-Band, Kn-Band & Ka-Band.

   (b)   State two advantages and two applications of continuous wave Radar.

   (c)   Describe working of directional coupler with neat diagram.

   (d)   Describe the working of TWT as an amplifier.

   (B)   Attempt any ONE :   **06**

   (a)   A glass clad fiber is made with core glass of refractive index 1.5 and the cladding is dopped to give fractional index difference of 0.0005. Find (i) The cladding index, (ii) The critical internal reflection angle, (iii) The Numerical aperture.

   (b)   Explain the working of MTI radar with the help of block diagram and with suitable waveforms.

5. **Attempt any FOUR :**   **16**

   (a)   Draw the field patterns of circular waveguide for its dominant mode.

   (b)   With neat sketch describe the operation of IMPATT diode.

   (c)   Draw block diagram of OTDR and explain its working.

   (d)   Define geostationary orbit and the geostationary satellite.

   (e)   Calculate critical angle of incidence between two substances with different refractive indices $n_1 = 1.5$ and $n_2 = 1.46$.

   (f)   Differentiate between LED and LASCR (any eight points).

6.   **Attempt any FOUR :**   **16**

    (a)   Differentiate between waveguide and two wire transmission line.

    (b)   Describe working and principle of avalanche photodiode with neat sketch.

    (c)   A step index fiber has a numerical aperture of 0.16, a core refractive index of 1.45 and core diameter of 90 mm, calculate

        (i)   The acceptance angle θ_a.

        (ii)   the refractive index of cladding.

    (d)   Draw the diagram of fusion splice and rigid alignment tube splice.

    (e)   How power is generated in satellite ? Describe how it is distributed to other subsystem of satellite.

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