23242

3 Hours / 70 Marks   Seat No. ⬚⬚⬚⬚⬚⬚⬚⬚

Instructions :   (1)   All Questions are *compulsory.*
        (2)   Answer each next main Question on a new page.
        (3)   Illustrate your answers with neat sketches wherever necessary.
        (4)   Figures to the right indicate full marks.
        (5)   Assume suitable data, if necessary.
        (6)   Use of Non-programmable Electronic Pocket Calculator is permissible.
        (7)   Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

                                                                Marks

1.   **Attempt any FIVE of the following :**   **10**

   (a)   Define cut-off frequency and cut-off wavelength.

   (b)   State the advantages of waveguide over transmission line.

   (c)   List the applications of microwave in various fields. (any four applications)

   (d)   Draw the neat sketch of Tapper and Twist.

   (e)   Draw V-I characteristics of Tunnel diode.

   (f)   State Doppler effect. Where it is used ?

   (g)   Draw the block diagram of Pulse Radar System.

2.   **Attempt any THREE of the following :**   **12**

   (a)   Compare rectangular waveguide and circular waveguide.

   (b)   Explain E-plane and H-plane Tee with suitable sketch.

   (c)   Describe working of reflex klystron amplifier with a neat diagram.

   (d)   Explain A-scope display method with diagram, used in radar system.

3. **Attempt any THREE of the following :** **12**

(a) Sketch the field pattern of TE_{10}, TE_{11} modes of rectangular waveguide.

(b) A rectangular waveguide is 5 cm × 2.5 cm. Calculate cut-off frequency of dominant mode.

(c) Draw the block diagram and explain operation of CW doppler Radar.

(d) Describe the working principle of TWT and state its two applications.

4. **Attempt any THREE of the following :** **12**

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

(b) Explain the working principle of Horn antenna with neat sketch.

(c) Describe the working principle of magnetron with the help of constructional diagram.

(d) Draw and explain the block diagram of MTI RADAR.

(e) Describe any one antenna used in RADAR.

5. **Attempt any TWO of the following :** **12**

(a) Determine cut-off wavelength for the dominant mode in Rectangular waveguide of breadth 10 cm for 2.5 GHz signal that propagates in this waveguide in the dominant mode. Calculate guide wavelength and group velocity.

(b) Draw a neat sketch of Gyrator and describe its working principle.

(c) Draw the construction of Gunn diode and describe its working.

6. **Attempt any TWO of the following :** **12**

(a) With neat sketch describe operation of PIN diode.

(b) Calculate the maximum range of RADAR for the following specifications :

    (i) Peak Power transmitted by the RADAR $P_t = 250$ kW.

    (ii) Gain of transmitting antenna $G = 4000$

    (iii) Effective aperture of receiving antenna $A_e = 4 \ m^2$.

    (iv) RADAR cross-section of the target $\sigma = 25 \ m^2$.

    (v) Power of minimum detectable signal $S_{min} = 10^{-12}$ W.

(c) Explain working principle & applications of SONAR system.

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