315342

Instructions – (1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

(3) Illustrate your answer 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) Draw the neat sketches of corners and twists.

b) Define the following term :–

i)   Group velocity

ii)   Phase velocity.

c) State RADAR range equation. State each term used in equation.

d) List two advantages of pulse RADAR system.

e) Draw neat sketch of Rat Race Junction (Hybrid Ring) and label it.

f) List limitations of vacuum tubes at microwave frequencies.

g) State the advantages of waveguide over transmission line.

Marks

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

a) Explain preventive measures from microwave radiation hazards.

b) Explain construction, working principle, application of wilkinson power divider.

c) Sketch the field pattern of TE_{10}, TE_{11}, TE_{20} modes of rectangular waveguide.

d) Define Doppler effect, Pulse width Pulse Repetition Frequency (PRF), Duty cycle w.r.t. RADAR.

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

a) Draw and explain Backward wave oscillator in detail.

b) Describe basic working principle of SONAR with neat sketch.

c) Two sources of same amplitude and same phase are connected to the coplanar arms of E plane tee. Explain how the power is divided when the coplanar arm lengths are :–

   i) same

   ii) differ by half wavelength

   iii) differ by once complete wavelength

   iv) differ by an arbitrary constant or amount.

d) Describe TEEE and OSHA standards role and band designations w.r.t. microwave communication.

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

a) Explain different. RADAR antenna scanning methods with neat diagram.

b) State the working principle of Reflex Klystron and illustrate setting up of oscillations in the tube using Applegate diagram.

c) Explain different microwave applications in real life with neat diagram.

d) List Antenna tracking types and describe any two in details.

e) With neat diagram, explain construction working principle and applications of HEMTs.

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

a) A rectangular waveguide has b = 1.5 cm, a = 3 cm, μr = 1, εr = 5 then calculate cutoff frequency for TE_{10} and TE_{11} mode, guide wavelength, characteristic Impedance, at 4 GHz, attenuation constant at 3 GHz for dielectric field guide, total attenuation at frequencies much less than the TE_{10} cut off frequency.

b) Compare with neat sketch Gyrator, Isolator and circulators. (Any six points)

c) Compare with neat sketch Pulsed RADAR, CW RADAR, MTI RADAR. (Any six points)

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

a) Compare with neat sketches BARITT Diode, IMPATT Diode, TRAPATT Diode. (Any six points)

b) Compare different RADAR applications in real life with neat diagram.

c) i) Compare surface clutter, sea clutter and land clutter. (Any six points)

ii) A RADAR operates at 10 GHz and Peak Power of 500 kW. Its maximum receivable power is 0.1 pW. Its antenna has capture area of 5 sqm and the RCS of the target is 20 sqm. then find maximum range of RADAR.

iii) Compare with neat sketches A scope, PPI, RHI display methods w.r.t. RADAR.

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