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12425 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. Marks 1. 10 Attempt any FIVE of the following : (a) Draw microwave frequency spectrum. (b) State any two advantages and disadvantages of waveguides. (c) Draw the neat sketches of corners and twists. (d) State the applications of magic tee (any 2) (e) List the applications of Tunnel Diode. (f) Give the factors affecting maximum range of RADAR. (g) Define the term antenna scanning. State its types. 2. 12 Attempt any THREE of the following : (a) Distinguish between TE mode and TM mode in rectangular waveguide (any 4 points).



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- (b) With the help of neat constructional diagram explain the working of Gyrator.
- (c) Draw labelled sketch of TWT. Give its two applications.
- (d) List antenna tracking methods used in RADAR. Explain any one method in detail.

3. Attempt any THREE of the following :

- (a) Differentiate between circular waveguide and rectangular waveguide with respect to
 - (i) construction
 - (ii) Definition
 - (iii) Dominant mode
 - (iv) Application
- (b) State two advantages and two applications of CW RADAR.
- (c) Draw block diagram of Basic RADAR System and describe its working.
- (d) Draw the construction of Gunn diode and describe its working.

4. Attempt any THREE of the following :

- (a) Draw neat labelled diagram of Reflex Klystron and explain its working principle.
- (b) Describe the working of two hole directional coupler with neat sketch.
- (c) Describe the working principle of PIN diode with neat diagram.
- (d) State the Doppler effect. Explain the working of CW Doppler RADAR with neat block diagram.
- (e) Draw the neat sketch and explain PPI display used in RADAR system.

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5. Attempt any TWO of the following :

- (a) A rectangular waveguide having dimensions a = 4.5 cm, b= 3 cm and signal propagated in it at 9 GHz. Calculate the following for TE₁₀ mode :
 - (i) Cut off wavelength
 - (ii) Guide wavelength
 - (iii) Phase velocity
- (b) Illustrate the properties of Hybrid Tee junction with neat sketch. Explain how magic tee acts as duplexer.
- (c) Describe how bunching is formed in magnetron, with the help of neat sketch.Also write its applications.

6. Attempt any TWO of the following :

- (a) State the names of microwave diodes suitable for following applications :
 - (i) Airborne RADAR
 - (ii) Logic operations
 - (iii) Phase shifter
 - (iv) Microwave oscillator
 - (v) Pulse modulator
 - (vi) Micro wave generators
- (b) Calculate maximum range of RADAR if its output power is 1 MW, minimum detectable signal of 0.5 MW, operating at 4 GHz frequency with antenna gain 20 dB & bandwidth 1 MHz. The target cross sectional area is 3 sq.m.

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(c) Identify the given diagram. Name the blocks labelled A, B and C, also write their functions. Refer Figure-1.



Figure-1

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