

315342

25226

3 Hours / 70 Marks

Seat No.

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- 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) Define the following terms with respect to transmission lines:
- i) VSWR
- ii) Reflection coefficient
- b) Draw neat sketches of tapers and twists.
- c) List any two applications of microwave cavity resonator.
- d) Draw microwave frequency spectrum and designate appropriate band in it.
- e) State applications of varactor diode. (Any two points)
- f) Define pulse width and pulse repetition frequency w.r.t. radar.
- g) Draw block diagram of basic pulse radar system.

P.T.O.

2. Attempt any THREE of the following: 12

- a) Compare waveguide with transmission line on the basis of:
 - i) Construction
 - ii) Supporting theory
 - iii) Operating mode
 - iv) Application.
- b) Describe working principle of Heterojunction Bipolar Transistor (HBT) with its structural diagram.
- c) Draw relevant sketch of A scope display used in RADAR system and state its working principle.
- d) With the help of neat constructional diagram explain the working of Isolator.

3. Attempt any THREE of the following: 12

- a) For a rectangular waveguide:
 - i) Define TE mode and TM mode.
 - ii) Sketch field pattern of TE_{10} mode.
- b) Derive the maximum radar range equation and state factors affecting range of RADAR.
- c) Draw block diagram of MTI RADAR and explain detection of moving target.
- d) Draw symbol of Tunnel Diode. Describe working of Tunnel Diode.

4. Attempt any THREE of the following: 12

- a) With neat cross sectional constructional diagram, describe the effect of electric and magnetic field in magnetron.
- b) Draw constructional diagram and explain working principle of microwave phase shifter.
- c) Compare between IMPATT, TRAPATT and BARITT diode w.r.t.:
 - i) Operating principle
 - ii) Operating frequency
 - iii) Output power
 - iv) Application.

- d) Explain antenna scanning methods with neat diagram used for RADAR.
- e) Draw block diagram of CW Doppler RADAR and explain Doppler effect.

5. Attempt any TWO of the following: 12

- a) A rectangular waveguide has dimensions $a = 2.5$ cm, $b = 1$ cm. Find all the possible modes which will propagate at 8.66 GHz.
- b) Draw the neat sketch of hybrid tee junction. State its properties. Explain function of hybrid Tee as a duplexer.
- c) List any four applications of microwave systems. With the help of neat sketch explain Long Range Navigation System (LORAN).

6. Attempt any TWO of the following: 12

- a) Calculate maximum range of RADAR for given specifications:
 - i) Peak power transmitted by RADAR is 200 kW.
 - ii) Effective aperture of receiving antenna is 3m^2 .
 - iii) Radar cross section of the target is 15 m^2 .
 - iv) Power of minimum detectable signal is 10^{-10} W.
 - v) Gain of transmitting antenna is 2000.
 - b) Describe with neat sketch the bunching process of two cavity Klystron with the help of apple gate diagram. State its two applications.
 - c) Explain working principle of SONAR system with the help of suitable diagram. State types and any two applications of SONAR.
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