F 3174 (Pages : 2) Reg. No..............................

Name......................................

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Seventh Semester

Branch : Electronics and Communication Engineering

MICROWAVE AND RADAR ENGINEERING (L)

(Regular/Supplementary/Mercy Chance)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions briefly.
Each question carries 4 marks.

1. Deduce the S-matrix for a directional coupler.

2. Explain the properties of an H-plane T.

3. Draw the applegate diagram for Klystron amplifier and explain.

4. Explain strapping in magnetrons.

5. Using energy band diagrams, explain the tunnel diode characteristics.

6. Explain the different modes of operation of a microwave NPN transistor.

7. What is minimum detectable signal? Discuss the issues involved while setting the threshold level in a radar receiver.

8. Discuss the limitations to MTI performance.

9. Explain the role of satellites in navigation.

10. Explain the direction finding using loop antenna.

$(10 \times 4 = 40 \text{ marks})$

Part B

Answer any one full question from each module.
Each full question carries 12 marks.

Module I

11. Discuss in detail, the TE modes in rectangular waveguides. Also describe the power transmission in rectangular waveguides.

Or

Turn over

12. With a neat diagram, explain the operation of a 4-port circuit and derive the S-matrix for the same.

MODULE II

13. With a neat diagram, explain the construction and working of a travelling wave tube. Obtain an expression for the power gain of a TWT amplifier.

Or

14. Explain with suitable sketches the principle of velocity modulation and trenching process in a reflex Klystron. Derive the expressions for the power output and efficiency of reflex Klystron.

MODULE III

15. Describe the physical structure of IMPATT diode and explain how its negative resistance varies with transit angle. Also discuss their power output and efficiency.

Or

16. (a) Describe the principle of an N-type GaAs Gunn diode oscillator using two-valley model.
                                                                            (8 marks)

    (b) Bring out the differences between transferred electron devices and avalanche transit time devices.
                                                                            (4 marks)

MODULE IV

17. With neat block diagram, explain the working principle of a FM-CW radar. Discuss its applications.

Or

18. With necessary diagrams and equations, explain.
    (i) working principle of MTI radar.   (4 marks)
    (ii) butterfly effect.   (2 marks)
    (iii) delay line canceller.   (2 marks)
    (iv) coherent MTI radar with power amplifier transmitter.   (4 marks)

MODULE V

19. (a) With neat diagrams, explain LORAN-A system.   (6 marks)
    (b) With a neat block diagram, explain the doppler navigation system.   (6 marks)

Or

20. With a neat block diagram, explain Navstar GPS, along with its receiver block diagram. Describe its signal structure, data message and velocity determination.

[5 × 12 = 60 marks]