(PART-B : Descriptive)

Time : 2 hrs. 40 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. Define antenna. Classify different types of antenna. Explain working of 2-Element array antenna. 2+3+5=10

2. a. Derive RADAR range equation indicating significance of each term. 5+5=10
   b. Explain radiation pattern mechanism of antenna.

3. a. Define scattering parameter and its significance. Write scattering parameter for power divider. 4+3+3 =10
   b. Define different types of satellite orbits. Write down different types of earth station. What are the different major subsystems of communication satellite?

4. a. Explain with block diagram the TT&C subsystem of satellite in space segment. 6+4=10
   b. Draw the functional block diagram of an earth station. Explain it.

5. a. What are the different types of satellite tracking system? Explain one of it. 6+4=10
   b. Explain source coding of satellite communication system.

6. a. Explain modulation process employed in satellite communication system. 5+5=10
   b. Discuss TDMA and FDMA employed for satellites.

7. a. Derive Friis's free space propagation equation indicating importance of the equation. 5+5=10
   b. Explain directivity gain and radiation intensity of antenna.

8. a. Explain earth station transmitter with proper diagram. 5+4=10
   b. Explain basic elements of satellite communication system.

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M.Sc. ELECTRONICS
FOURTH SEMESTER
ELECTROMAGNETIC THEORY AND MICROWAVE TECHNOLOGY-II
MSE-404 A

(Use separate answer scripts for Objective & Descriptive)

Duration: 3 hrs. **Full Marks: 70**

(PART-A : Objective)

Time: 20 min. **Marks: 20**

Choose the correct answer from the following: *1X20=20*

1. Interface that converts..... waves to..... waves and vice-versa is called antenna.
   a. $\frac{V}{I}, \frac{E}{H}$ b. $\frac{E}{H}, \frac{V}{I}$
   c. $\frac{I}{V}, \frac{H}{E}$ d. none of the above

2. Beamwidth between full Nulls (BWFN) is equal to:
   a. HPBW b. 2 x HPBW
   c. 0.5 x HPBW d. 4 x HPBW

3. In array antenna $\alpha = 0, d = \lambda/2$ leads half power points at:
   a. $\theta = \pm 60^\circ$ *and* $\pm 120^\circ$ b. $\theta = \pm 90^\circ$ *and* $\pm 120^\circ$
   c. $\theta = \pm 45^\circ$ *and* $\pm 180^\circ$ d. $\theta = \pm 30^\circ$ *and* $\pm 120^\circ$

4. Frii's free space propagation equation is:
   a. $W_R = W_T \frac{G_T G_R}{\left(\frac{4\pi d}{\lambda}\right)^2}$ b. $W_R = W_T \frac{G_T G_R}{\left(\frac{4\pi d}{\lambda}\right)}$
   c. $W_R = W_T \frac{G_T G_R}{\left(\frac{4\pi}{\lambda}\right)^2}$ d. $W_T = W_R \frac{G_T G_R}{\left(\frac{4\pi d}{\lambda}\right)^2}$

5. Radiation intensity of an antenna is:
   a. power per unit area b. power per solid angle
   c. power per unit volume d. power per unit length

6. Graph which shows distribution of field strength or power of EM wave at all points at equal distance from antenna is:
   a. radiation intensity b. radiation power
   c. radiation pattern d. radiation resistance

7. Functional block of Radar consists of:
   a. transmitter, duplexer, antenna b. transmitter, receiver
   c. duplexer, antenna d. transmitter, receiver, duplexer, antenna

8. In radar range equation $r_{max} =$ is given by:

a. $\left[\frac{P_t A^2_p \lambda^2 S}{(4\pi)^2 P_{min}}\right]^{\frac{1}{4}}$

b. $\left[\frac{P_t A^2_p \lambda^2 S}{(4\pi)^3 P_{min}}\right]^{\frac{1}{2}}$

c. $\left[\frac{P_t A^2_p \lambda^3 S}{(4\pi)^3 P_{min}}\right]^{\frac{1}{3}}$

d. $\left[\frac{P_t A^2_p \lambda^2 S}{(4\pi)^2 P_{min}}\right]^{\frac{1}{2}}$

9. For a symmetric three-port H-plane T- junction:

a. $S_{11} = S_{21}$ *and* $S_{13} = S_{23}$

b. $S_{11} = S_{31}$ *and* $S_{12} = S_{23}$

c. $S_{11} = S_{21}$ *and* $S_{31} = S_{23}$

d. $S_{11} = S_{22}$ *and* $S_{13} = S_{23}$

10. Scattering matrix is used in:

a. two port devices

b. n-port devices

c. three port devices

d. none of the above

11. Transponders are classified as:

a. single and double conversion type

b. transparent and regenerative type

c. linear and non-linear type

d. all of above

12. The major subsystem of a communication satellite in the geo orbit are:

a. transponder system

b. antenna system

c. thermal system

d. all of above

13. Open loop system of control in satellite tracking is known as:

a. manual tracking

b. program tracking

c. auto tracking

d. none of the above

14. Signals coming back from RADAR target is known as:

a. echoes

b. reflected signal

c. pulse

d. none of the

15. Performance of RADAR is determined by:

a. range equation

b. echoes

c. pulses

d. antenna

16. When signal amplitude vary instantaneous phase of the carrier is known as:

a. amplitude modulation

b. phase modulation

c. frequency modulation

d. digital modulation

17. Gain of an antenna is:

a. a measure of its directivity

b. a measure of the bandwidth

c. a measure of its power handling capability

d. all of the above

18. If f_m is highest frequency component in a signal, the sampling rate f_s required is:

a. $f_s \geq f_m$

b. $f_s \geq 2 f_m$

c. $f_s \leq f_m$

d. $f_s \leq 2 f_m$

19. The period of a satellite around the earth can be computed using:

a. Newton's law of gravitation

b. Kepler's second law

c. Newton's third law

d. Kepler's third law

20. Low earth orbit has typical altitudes in the range of:

a. 400-1500km

b. 10,000-20,000km

c. 20,000 and above

d. none of the above

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