



Seat No. : _____

TD-113

M.Sc. Sem.-IV

May-2013

510 – Physics

(Electronic Communication – II)

Time : 3 Hours]

[Max. Marks : 70

- Instructions :**
- (1) Attempt **all** questions.
 - (2) **All** questions carry equal marks.
 - (3) Symbols and terminology have their usual meanings.
 - (4) Scientific calculator may be permitted.

1. (a) Obtain the field components existing in a circular waveguide under TE mode. 7

OR

Obtain the wave equation for a hollow rectangular waveguide. Find its solution.

- (b) (i) Write short note on : Modes in a waveguide. 4
- (ii) An air filled circular wave guide is to be operated at a frequency of 6 GHz and is to have dimensions such that $f_c = 0.8 f$ for the TE_{11} mode. Determine the diameter of the guide, wavelength λ_g and the phase velocity v_g in the guide. (Take $X'_{11} = 1.841$). 3

OR

- (i) Discuss important properties of waveguide. 4
- (ii) The dominant mode is propagating in a rectangular waveguide of dimensions $a = 6.0$ cm and $b = 4.0$ cm. The distance between two adjacent minima is 4.47 cm. Determine the signal frequency of the dominant mode. 3

2. (a) Describe the principle, structure and main features of log-periodic antenna. 7

OR

Discuss the dissimilarities and similarities between broadside and end-fire driven array antennas. Give their structures.

- (b) Write short notes on : 7
- (i) Hertzian dipole
 - (ii) Grounded antenna

OR

Explain the terms : 4

- (i) Antenna resistance
- (ii) Antenna losses

An Antenna has a radiation resistance of 72Ω , a loss resistance of 8Ω , and a power gain of 16. What efficiency and directivity does it have ? 3

3. (a) Define image frequency and its rejection ratio. For an AM receiver, having no RF stage, the loaded Q of antenna coupling circuit is 100. If intermediate frequency (f_i) is 455 kHz, then calculate image frequency and its rejection ratio at signal frequency (f_s) of 1000 kHz. 7

OR

List the differences and similarities between AM and FM receiver. Draw the circuit of Amplitude limiter and explain its working.

- (b) For AM receiver, derive the expression for output signal to noise (S/N) ratio. 7

OR

What is meant by superheterodyne principle ? Draw the circuit of self excited mixer stage used in AM Receiver and explain its working.

4. (a) Draw block diagram and explain how pulsed radar works. 7

OR

Explain in detail display systems used in radars.

- (b) Discuss various factors affecting range of radar. 7

OR

Explain operation of CW Doppler radar. What are its main advantages over CW radar ?

5. Answer the following questions in brief (each question is of **one** mark) : **14**
- (i) Draw field patterns for TE₁₀ mode in a rectangular waveguide.
 - (ii) As the wavelength of the signal increases, the dimensions of a waveguide _____.
(Fill in the blank).
 - (iii) Define dominant mode in a waveguide.
 - (iv) Define directivity of an antenna.
 - (v) What is parabolic reflector ?
 - (vi) Draw radiation pattern of a dipole antenna of effective length $\frac{3\lambda}{2}$.
 - (vii) Impedance of reflector and director in a Yagi antenna is _____ and _____ respectively.
 - (viii) Name two applications of radar.
 - (ix) What is blind speed ?
 - (x) Write radar range equation.
 - (xi) Define selectivity of a Receiver.
 - (xii) Why Intermediate frequency is not chosen very low ?
 - (xiii) Define sensitivity of a Receiver.
 - (xiv) Calculate second blind speed for MTI radar operating at 4 GHz with repetition rate of 500 pps.
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