

22334

22232

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 answers 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 :

2 × 5 = 10

- (a) Define analog and digital signal with neat sketch.
- (b) Write down frequency range for the following in electromagnetic spectrum.
 - (i) Voice frequencies
 - (ii) Low frequencies
 - (iii) High frequencies
 - (iv) Extremely high frequencies
- (c) Write Carson's rule to calculate Bandwidth of FM wave.
- (d) List any four advantages of modulation.



- (e) Write the IF value of
 - (i) FM radio receiver
 - (ii) MW band in AM
- (f) Sketch neat diagram of duct propagation.
- (g) Draw a sketch of half wave dipole antenna and its radiation pattern.

2. Attempt any THREE of the following :

3 × 4 = 12

- (a) Compare synchronous and asynchronous transmission used in serial communication. (Any four points).
- (b) A superheterodyne radio receiver with an intermediate frequency of 455 KHz is tuned to a station operating at 1200 KHz Find the associated image frequency and local oscillator frequency.
- (c) Describe various layers of ionosphere with neat diagram.
- (d) Explain the structure of rectangular microstrip patch antenna with its radiation pattern.

3. Attempt any THREE of the following :

3 × 4 = 12

- (a) Derive mathematical expression for AM wave.
- (b) Draw time domain and frequency domain representation for FM wave with proper labelling.
- (c) Draw the block diagram of AM Superheterodyne receiver and state function of each block.
- (d) Compare sky wave and space wave propagation (any four points).
- (e) Draw a neat sketch of Yagi-Uda antenna and its radiation pattern. State function of each element in antenna.

4. Attempt any THREE of the following :**3 × 4 = 12**

- (a) Define simplex and half duplex modes of electronic communication using neat sketch. Also write applications for them.
- (b) Define modulation index for AM. State the effect of modulation index on AM wave with waveforms when $m = 1$, $m < 1$, $m > 1$.
- (c) Explain simple AGC and delayed AGC with neat sketches.
- (d) Define the following terms with neat sketches.
 - (i) Virtual height
 - (ii) Actual height
 - (iii) Skip distance
 - (iv) Maximum Usable frequency
- (e) Draw radiation pattern of the following resonant dipole antenna.
 - (i) $l = \lambda/2$
 - (ii) $l = \lambda$
 - (iii) $l = 3\lambda/2$
 - (iv) $l = 3\lambda$

where l is the length of dipole antenna.

5. Attempt any TWO of the following :**2 × 6 = 12**

- (a) Draw a block diagram of basic electronic communication system and explain function of each block.
- (b) Define sensitivity, selectivity and fidelity along with neat graphs and neat labelling.
- (c) Describe ground wave propagation with neat sketch. Write two advantages and disadvantages of it.

P.T.O.

6. Attempt any TWO of the following :

$2 \times 6 = 12$

- (a) A modulating signal $10 \sin (2\pi \times 10^2 t)$ is used to modulate a carrier signal $14 \sin (2\pi \times 10^3 t)$. Find modulation index, percentage modulation, frequencies of sidebands and their amplitude, Bandwidth of modulated signal. Also draw frequency spectrum of AM wave.
 - (b) Explain the concept of pre-emphasis and de-emphasis with circuit diagram and characteristics used in FM system.
 - (c) Draw constructional details of dish antenna. Describe its operating principle. Also draw its radiation pattern.
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