

22334

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- 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 :**

**10**

- (a) Classify types of Noise.
- (b) In AM, modulating frequency is 10 kHz and carrier frequency is 1 MHz. Determine the resultant frequency components.
- (c) Write mathematical expression representing FM wave.
- (d) Draw block diagram of High level AM transmitter.
- (e) Draw FM wave for modulating signal of 100 Hz  $1 V_{p-p}$ .
- (f) Define electromagnetic polarization and list its types.
- (g) Illustrate concept of virtual height with neat labelled diagram with respect to wave propagation.

**2. Attempt any THREE :****12**

- (a) State frequency range of the following :
  - (i) Audio frequency
  - (ii) IR frequency
  - (iii) Voice frequency
  - (iv) High frequency
- (b) Show that AM wave consists of two side bands and a carrier. Prove that bandwidth of AM is double of modulating frequency.
- (c) A superheterodyne radio receiver with an intermediate frequency of 455 kHz is turned to a station operating at 1200 kHz. Find associated image frequency and local oscillator frequency.
- (d) Compare sky wave propagation and space wave propagation (Any four points).

**3. Attempt any THREE :****12**

- (a) State and explain the concept of Transmission bandwidth.
- (b) Calculate the percentage power saving of an SSB signal if the AM wave is modulated to a depth of (i) 100% (ii) 50%.
- (c) Draw block diagram of superheterodyne AM receiver and explain working of each block.
- (d) Draw a neat sketch of Duct propagation and explain its basic principle.

**4. Attempt any THREE :****12**

- (a) Distinguish between Half duplex and Full duplex communication (Any four points).
- (b) Explain effect of modulation index on AM wave with waveforms.

- (c) Explain the terms selectivity and sensitivity with respect to radio receiver. Illustrate with respective curves.
- (d) Describe Troposphere scatter propagation along with sketch.
- (e) Draw radiation pattern of given antennas :
  - (i) Yagi-Uda antenna
  - (ii) Loop antenna
  - (iii) Dish antenna
  - (iv) Horn antenna

**5. Attempt any TWO :****12**

- (a)
  - (i) Define modulation index of FM wave.
  - (ii) The equation of FM wave is
$$e_{FM} = 20 \sin (10^8 t + 4 \sin 10^3 t).$$
 Calculate
    - (1) Carrier frequency
    - (2) Modulating frequency
    - (3) Modulation Index
    - (4) Power dissipated in  $10 \Omega$  resistor
- (b) State need of AGC. List types of AGC. Draw and explain AGC characteristics for delayed, ideal and simple AGC.
- (c) Define radiation pattern of an antenna. Draw radiation pattern for resonant dipole
  - (i)  $l = \lambda_2$
  - (ii)  $l = \lambda$
  - (iii)  $l = 3\lambda/2$
  - (iv)  $l = 3\lambda$

**6. Attempt any TWO :****12**

- (a) State relation between the transmitted power and carrier power in AM. Show effect of modulation index on total transmitted power.
  - (b) Define fading. List major causes of fading and explain them.
  - (c) Describe Yagi-Uda antenna with a neat sketch. State any two advantages of Yagi-Uda antenna.
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