

**DiplETE – ET (Current & New Scheme)**

Time: 3 Hours

**DECEMBER 2015**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**NOTE: There are 9 Questions in all.**

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2 × 10)**

- The noise, which is great importance at high frequencies is \_\_\_\_\_  
(A) shot noise (B) random noise  
(C) impulse noise (D) transit-time noise
- Amplitude modulation is used for broadcasting because \_\_\_\_\_  
(A) it is more noise immune than other modulation systems.  
(B) compared with other systems it requires less transmitting power  
(C) its use avoids receiver complexity  
(D) no other modulation system can provide the necessary bandwidth for high Fidelity
- Vestigial sideband (VSB) modulation is normally used for  
(A) HF point-to-point communication  
(B) Monaural broadcasting  
(C) TV broadcasting  
(D) Stereo broadcasting
- A pre-emphasis circuit provides extra noise immunity by \_\_\_\_\_  
(A) boosting the bass frequencies  
(B) amplifying the higher audio frequencies  
(C) preamplifying the whole audio band  
(D) converting the phase modulation to FM
- The image frequency of a superheterodyne receiver \_\_\_\_\_  
(A) is created within the receiver itself  
(B) is due to insufficient adjacent channel rejection  
(C) is not rejected by the IF tuned circuits  
(D) is independent of the frequency to which the receiver is tuned
- The standard reference antenna for the directive gain is the \_\_\_\_\_  
(A) infinitesimal dipole (B) isotropic antenna  
(C) elementary doublet (D) half-wave dipole
- The absorption of radio waves by the atmosphere depends on \_\_\_\_\_  
(A) their frequency  
(B) their distance from the transmitter  
(C) the polarization of the waves  
(D) the polarization of the atmosphere

- h. When a particular mode is excited in a waveguide, there appears an extra electric component, in the direction of propagation, the resulting mode is \_\_\_\_\_  
 (A) transverse-electric (TE) mode      (B) transverse-magnetic (TM) mode  
 (C) longitudinal      (D) transverse-electromagnetic (TEM) mode
- i. Pulse-width modulation is generated \_\_\_\_\_  
 (A) by differentiating pulse-position modulation  
 (B) with a monostable multivibrator  
 (C) by integrating the signal  
 (D) with a free-running multivibrator
- j. A scheme in which several channels are interleaved and then transmitted together is known as \_\_\_\_\_  
 (A) Frequency-Division Multiplex      (B) Time-Division Multiplex  
 (C) a Group      (D) a Supergroup

**Answer any FIVE Questions out of EIGHT Questions.**

**Each question carries 16 marks.**

- Q.2** a. What is a Carrier Wave? Draw and explain the block diagram of typical radio transmitter. (7)
- b. What is shot noise and explain its calculations? (5)
- c. An amplifier operating over the frequency range from 18 to 20 MHz has a 10 K $\Omega$  input resistor. What is the rms noise voltage at the input to this amplifier if the ambient temperature is 27 $^{\circ}$  C ? (4)
- Q.3** a. Define Amplitude Modulation. Derive an expression for its Amplitude Modulated Wave by assuming the modulating signal voltage  $e_m = E_m \sin \omega_m t$  and the carrier signal voltage as  $e_c = E_c \sin \omega_c t$ . (8)
- b. With the help of a block diagram, explain the working of Third Method used for generating SSB signal. (8)
- Q.4** a. Draw the circuit diagram of basic Reactance Modulator and explain its working by deriving an expression for its Capacitive Reactance. (8)
- b. Compare the differences between Frequency and Phase modulations. (4)
- c. A Frequency Modulated Wave is represented by the voltage equation as  $v = 12 \sin(6 \times 10^8 t + 5 \sin 1250 t)$ . Find: (4)
- (i) Carrier Frequency  
 (ii) Modulating Frequency
- Q.5** a. Draw the block diagram of FM Superheterodyne Receiver and explain the function of each block. (8)
- b. Draw the block diagram of Pilot-Carrier Single Sideband Receiver and describe its working. (8)

- Q.6** a. Explain the following related to antennas:- (8)
- (i) Directive Gain
  - (ii) Antenna Efficiency
  - (iii) Bandwidth
  - (iv) Beamwidth
- b. Explain the characteristics, radiation pattern and applications of the following antennas:- (8)
- (i) Yagi-Uda Antenna
  - (ii) Rhombic Antenna
- Q.7** a. What is ionosphere? Explain its effects. (8)
- b. A rectangular waveguide measures 3 X 4.5 cm internally and has a 9-GHz signal propagated in it. Calculate the following characteristics for  $TM_{1,1}$  mode (8)
- (i) Cutoff wavelength
  - (ii) Guide Wavelength
  - (iii) Group Velocity
  - (iv) Phase velocity
- Q.8** a. What is Pulse Code Modulation? Describe its principle with the help of suitable diagram. Also list out its advantages and applications. (8)
- b. What is Frequency Shift Keying? Describe briefly. (8)
- Q.9** Write short note on any TWO the following: (2×8)
- (i) Time Division Multiplexing
  - (ii) Coaxial Cables
  - (iii) Submarine Cables