SEAT No._____

[98]

SARDAR PATEL UNIVERSITY

M. Sc. (Physics) IV Semester Examination

Day and Date: Monday, 17th April, 2017

Time: 2.00 pm to 5.00 pm

Subject: Signal Processing and Satellite Communication

Paper No: PS04EPHY03

Total Marks: 70

Q.1 Multiple choice Questions. (8)

(1) IC 4016 is used for _____.
(a) PAM (b) PCM (c) PTM (d) PDM

(2) In optical fiber communication, the carrier frequency is around _____ Hz.
(a) 10^{14} (b) 10^{9} (c) 10^{6} (d) 10^{10}

(3) In cellular telephone network, the shape of each cell is _____.
(a) circular (b) hexagonal (c) rectangular (d) triangular

(4) In satellite communication, the propagation delay in signal transmission is _____.
(a) 600μs (b) 600ms (c) 600ns (d) 600s

(5) If the output stage in a transmitter is _____, the modulation is known as high level modulation.
(a) Collector (b) Emitter (c) Base (d) None of them

(6) What is the importance of single side band technique?
(a) Reduces the transmission power (b) Easy to produce
(c) No carrier wave is required (d) No modulating wave is required

(7) In Television system, the continuous motion of picture is due to the principal of _____ of vision.
(a) Persistence (b) Perception (c) Sensitivity (d) Color

(8) In amplitude modulation, the side band power equation is _____.
(a) $\frac{m^2}{4}\frac{V_c^2}{2R}$ (b) $\frac{m^2}{4}\frac{V_c^2}{R^2}$ (c) $\frac{m^2}{2}\frac{V_c^2}{4R^2}$ (d) $\frac{m^2}{2}\frac{V_c^2}{R^2}$

Q.2 Short questions (Attempt any seven) (14)

(1) Write down the structure of IMEI number. Indicate the TAC, remainder of TAC and check digit.
(2) What is the significance of companding?
(3) Give a difference between TDM and FDM.
(4) Mention different types of MODEMS. What is a basic difference between them?
(5) Why the frequency of uplink is always higher than that of a downlink?
(6) Discuss in short the basic reactance modulator for generation of frequency modulation.
(7) Discuss the Phase Modulation (PM) method and its modulation index.

(8) Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of (a) 100 percent and (b) 50 percent.

(9) Discuss the difference between Tuned Radio Frequency (TRF) and Super heterodyne receiver.

Q.3 (a) What is a communication system? Draw the basic block diagram of communication system and explain each block in detail. Why modulation is required in communication system? (6)

(b) Explain amplitude modulation (AM) and derive the frequency equation of AM using carrier and modulating wave sine wave equations. Define its modulation index. Derive power relations in the AM wave. (6)

OR

(b) List various sources of random noise and impulse noise external to a receiver. How can some of them be avoided or minimized? What is the strongest source of extraterrestrial noise? (6)

Q.4 (a) With schematic circuit diagram and waveforms, explain Grid-Modulated Class C amplifier for generation of amplitude modulated (AM) wave. (6)

(b) With schematic circuit diagram, mathematically discuss in details Balanced Modulator for generation of SSB signal. (6)

OR

(b) With the help of block diagram of transmitter and receiver, describe the basic monochrome television system. Explain how television is capable of displaying complete moving pictures, despite the fact that at any instant of time, only a tiny portion of the picture tube screen is active. (6)

Q.5 (a) Draw the block diagram of satellite transponder. Explain the significance and operation of each block. (6)

(b) What is PCM? Why it is known as digital modulation process? Using necessary example, explain the quantization of signal in PCM. Why the pulsating waveform is considered as digital output? (6)

OR

(b) Which are the synchronization techniques used in MODEM? Discuss in detail the asynchronous synchronization technique with necessary byte structure. (6)

Q.6 (a) Draw the structure of cell in cellular technology. Describe in detail the cellular telephone communication in detail. (6)

(b) With the help of necessary example, explain the IMEI number and its identification method. (6)

OR

(b) What are GSM and CDMA? Differentiate between GSM and CDMA. Mention the advantages and disadvantages of GSM and CDMA. (6)

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