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SARDAR PATEL UNIVERSITY

M. Sc. (Physics) IV Semester Examination

Day and Date : Friday, 13th April, 2018

Time : 10.00 am to 1.00 pm

Subject : Signal Processing and Satellite Communication

Paper : PS04EPHY03

Total Marks : 70

- Q.1 Multiple choice questions (8)
- (1) In case of PAM, the quantization noise is minimum for ___ quantization levels.
 (a) 8 (b) 16 (c) 32 (d) 64
- (2) The condition for sampling frequency in PAM is _____.
 (a) $f_m < 2f_s$ (b) $f_m > 2f_s$ (c) $f_m > 3f_s$ (d) $2f_s < f_m < 3f_s$
- (3) FDMA is used in _____ mobile networks.
 (a) 2G (b) 3G (c) 4G (d) 3G and 4G
- (4) The shape of a cell in cellular technology is _____.
 (a) circular (b) triangular (c) square (d) hexagonal
- (5) Which among the following is a noise that becomes of great importance at high frequencies?
 (a) impulse noise (b) random noise (c) shot noise (d) transit time noise
- (6) In an amplitude modulated wave (A3E or DSBFC), if V_{max} is twice the value of V_{min} then the modulation index is _____.
 (a) 50% (b) 33.33% (c) 66.66% (d) 100%
- (7) The carrier frequency of a FM wave represented by $v = 10 \sin(5 \times 10^8 t + 6 \sin 2250t)$ is _____ MHz.
 (a) 79.6 (b) 95.5 (c) 100 (d) 5
- (8) The phase shift method is used to _____.
 (a) suppress the carrier wave (b) suppress the sideband
 (c) obtain FM (d) obtain PM
- Q.2 Short answer questions (attempt any seven) (14)
- (1) Explain how signals are represented in time and frequency domains.
- (2) What is signal to noise ratio? How is it important to know about this for communication system?
- (3) Discuss about the required bandwidth for a meaningful communication via amplitude modulation.
- (4) Show how LC tuned circuit can be used as basic FM generator.
- (5) What is transceiver? Explain its application.
- (6) Calculate the guard band of a telephone network to transmit 3.3 KHz frequency.
- (7) Why the bandwidth of optical fiber communication is very high?
- (8) What is a companding process? Mention its applications.
- (9) Write down the sampling theorem. What is its importance in PAM?

(P.T.O.)

- Q.3. (a) What is noise in a communication system? Discuss various types of noise and their sources in detail. (6)
- (b) Define frequency modulation. Derive the equation for frequency modulated wave and define its modulation index. Also describe the frequency spectrum of the FM wave. (6)

OR

- (b) Show how a substantial amount of power can be saved by SSB techniques. (6)

- Q.4. (a) Discuss the effect of non linear resistance on added signals and show how it can be used by FET balanced modulator to suppress the carrier of DSBFC AM wave (A3E). (6)
- (b) What are the methods used for suppression of an unwanted sideband? Explain any two of them. (6)

OR

- (b) Explain the generation of FM wave with the help of a basic reactance modulator. (6)

- Q.5. (a) Taking necessary example, describe the entire process involved in pulse amplitude modulation. Draw the waveform in each case. Explain the single polarity and dual polarity waveforms in PAM. (6)
- (b) Draw the block diagram of satellite communication link. What are uplink, downlink models and transponder? Using necessary block diagram representation, explain in detail the uplink model. (6)

OR

- (b) What is MODEM? What is its function? Enlist the synchronization processes used in MODEM. Describe the asynchronous data format used in data communication systems. (6)

- Q.6. (a) Why the IMEI number is compulsory in mobile communication using GSM technology? Write its format. What is the significance of Luhn digit? Taking necessary example, explain the format of IMEI number. (6)
- (b) Which are the multiple access systems used in mobile communication technology? Compare GSM and CDMA technology with reference to their various features. (6)

OR

- (b) Why the shape of cell structure in cellular technology is always hexagonal? What are the advantages of cellular technology? Draw the structure of a cellular network and explain its operation in detail. (6)

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