B.TECH. INSTRUMENTATION AND ELECTRONICS ENGINEERING THIRD YEAR SECOND SEMESTER EXAMINATION - 2018

Subject: Telemetry and Remote Control

Time : Three hours | Full Marks : 100

Answer any FIVE questions.

1. (a) State and prove the uniform sampling theorem. 10
   (b) A bandlimited signal g(t) is sampled at the Nyquist rate. Describe a method for the reconstruction of the original signal from its samples. 6
   (c) Determine the minimum sampling rate and the Nyquist interval for the signal,
   $f(t) = 7\,Cos^3\,800t + 70\,Sin^2\,1800t$ 4

2. (a) Distinguish between the naturally sampled and the flat-top PAM signals. How can you generate naturally sampled PAM signals using an emitter follower circuit with an npn transistor?
   Comment on the detection of such signals using a diode envelope detector circuit. 12
   (b) With the help of block and waveform diagrams, explain the generation of pulse time modulated signals from different types of pulse amplitude modulated signals. 8

3. (a) Explain the possible outcomes, if, in a multi-channel time division multiplexer unit , the number of channels becomes very large.
   Suggest suitable remedies. 8
   (b) For a TDM-PAM receiver, explain,
   i) the clock recovery process,
   and ii) the channel synchronization techniques. 12

4. (a) Compare the performances of a frequency division multiplexing system with those of a time division multiplexing system. 5
   (b) Draw the block diagrams of a multichannel frequency division multiplexer-demultiplexer system. (No description is necessary) 6
   (c) "A superheterodyne radio receiver is actually a frequency division demultiplexer." Justify.
   Explain the principle of operation of such a receiver. 9

5. (a) What is meant by the pulse code modulation (PCM) ? Discuss the advantages and disadvantages of such a modulation over other modulation techniques. 6

(b) Explain the occurrence of the "quantization noise" in a PCM system. How does it affect the performance of the system?
Suggest suitable remedies to overcome the situation. 14

6. (a) How can ASK, FSK and BPSK signals be generated using,
i) sinusoidal carriers and ii) pulse carriers ? 10

(b) What is a costa loop ? With the help of block diagram and necessary derivations, explain the demodulation of a BPSK signal using a costa loop. 10

7. (a) Write down the advantages and disadvantages of using geostationary satellites for telemetering purpose. 4

(b) What are the most popular frequency bands used in satellite telemetry? Write down the advantages and disadvantages of using such frequency bands. 6

(c) Explain the function of a satellite transponder. 5

(d) Write down the methods used for multiple access in satellite telemetry. 5

8. Write short notes on (any two) : - 10 x 2

(a) Sample and hold circuits for TDM systems,
(b) Generation of PTM signals using IC 555s,
(c) Delta modulation system,
(d) Quadrature amplitude modulation.