

V SEMESTER B.TECH. (PRINT AND MEDIA TECHNOLOGY) END SEMESTER EXAMINATIONS, NOV/DEC 2016 SUBJECT: COMMUNICATION SYSTEMS [PMT 4006]

REVISED CREDIT SYSTEM (05/12/2016)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.
- 1A. With a neat diagram, explain the working of an envelope detector. Also explain how a single envelope detector is sufficient in a super heterodyne receiver to demodulate AM signals with different carrier frequencies.
- **1B.** Derive an expression for the total power carried by an AM wave assuming that the message signal is obtained by adding two individual sinusoidal signals.
- **1C.** A message signal $m(t) = 4\cos(2\pi 100t) * 2\cos(2\pi 200t)$ is used to amplitude modulate a carrier signal $c(t) = 20\cos(2\pi 20000t)$. Find the bandwidth required for the transmission.

[05+03+02]

2A. i)Find the minimum sampling frequency required to sample the signal $m(t) = 4\cos(2\pi 100t) * 2\cos(2\pi 200t) * \cos(2\pi 600t) + 4\cos(2\pi 200t)$

ii) Find the sampling frequency required if this signal is passed through a high pass filter with cut off 600Hz.

iii) Find the sampling frequency required if this signal is passed through a low pass filter with cut off 240Hz.

- **2B.** Give the advantages and disadvantages of digital communication over analog communication.
- **2C.** A message signal with maximum frequency component of 4.8KHz is converted into PCM coded stream with bit depth of 4 bits/sample. Find the minimum data rate required to transmit this signal.

[05 + 03 + 02]

- 3A. Calculate the time taken by a satellite to complete one rotation around the earth. Assume that the height of satellite above earth is 36000Km, radius of earth is 6400Km, mass of earth is 6x10²⁴Kg and gravitational constant G is 6.67x10⁻¹¹m³/KgS². Derive the expression used.
- **3B.** Compare the LEO, MEO and GEO satellite orbits.
- 3C. Find the power received by a receiver located at 10KM from a 50W transmitter. The carrier frequency is 6GHz and free space propagation is assumed. Given: Gain of transmitting antenna 10 dB and gain of receiving antenna as 12dB respectively.

[05 + 03 + 02]

- 4A. Explain function of mobile station in GSM system. Also explain how a call is made from a mobile station by mentioning the role of mobile equipment, base station and mobile switching centre.
- **4B.** A transmitter is radiating a power of 2W from an antenna with a gain of 17dB in the direction of an observer. If the receiving antenna at a distance of 40000Km has a gain of 52.3db receives a power of -133db, find the operating frequency.
- **4C.** Briefly explain the working of DTMF system used in telephone.

[05+03+02]

- **5A.** A step index fiber has core and cladding refractive indices as 1.48 and 1.475 respectively. Find the maximum acceptance angle and numerical aperture assuming,
 - a) Surrounding medium as free space
 - b) Surrounding medium with refractive index of 1.4.
- **5B.** A step index fiber has a normalized frequency of 26.6 with core diameter 50um and numerical aperture is 0.22. If core refractive index is 1.479, find the refractive index of the cladding. Also find the operating frequency.

[05 + 05]