



Paper id: 252776

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Subject Code: BEC401

Roll No:

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**BTECH**  
**(SEM IV) THEORY EXAMINATION 2024-25**  
**COMMUNICATION ENGINEERING**

**TIME: 3 HRS****M.MARKS: 70****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****02 x 7 = 14**

Q no.	Question
a.	Represent following time domain signals into frequency domain : (i) $\delta(t)$ (ii) $\sin(at)$
b.	Why we need modulation in Communication System?
c.	State Carson's Rule for estimating the bandwidth of an FM signal.
d.	What is Figure of Merit.
e.	Define white noise.
f.	Explain pulse amplitude modulation (PAM).
g.	Explain QPSK in short.

**SECTION B****2. Attempt any three of the following:****07 x 3 = 21**

a.	Explain Single Sideband Suppressed Carrier (SSB-SC) modulation. How does it differ from standard Amplitude Modulation (AM)? Derive the mathematical expression for an SSB-SC signal. Discuss its advantages in terms of power and bandwidth.
b.	A message signal is given by: $m(t) = 5\cos(1000\pi t)$ . The carrier signal is given by $c(t) = 10\cos(2\pi \cdot 10^5 t)$ . Given: For FM: $k_f = 75 \text{ kHz/V}$ and For PM: $k_p = 1 \text{ rad/V}$ . Write down expression of FM and PM signal. Compare bandwidth of both.
c.	Explain following : (i) Random Processes (ii) Autocorrelation Function (iii) Power Spectral Density for White Gaussian noise (iv) Probability Density Function (v) Cumulative Distribution Function
d.	Explain the sampling theorem and its significance in the context of pulse modulation. What happens if the sampling rate is below the Nyquist rate?
e.	Discuss QAM in detail.

**SECTION C****3. Attempt any one part of the following:****07 x 1 = 07**

a.	An audio signal given by $m(t)$ amplitude modulates a carrier signal $c(t)$ . Where $m(t) = 40 \sin(600\pi t)$ millivolt and $c(t) = 100 \sin(2\pi \times 10^5 t)$ millivolt. (Load Resistance is of 1ohm). Calculate following: (i) Modulation Index (ii) Equation of AM Signal (iii) Message Signal Power (iv) Carrier Signal Power (v) Total AM Signal Power (vi) Bandwidth of AM Signal (vii) Transmission Efficiency.
b.	Explain working of DSB-SC Modulator and Demodulator.



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**4. Attempt any one part of the following: 07 x 1 = 07**

a.	Write down difference between NBFM and WBFM in terms of spectral characteristics and mathematical expression.
b.	Define angle modulation. Compare frequency modulation (FM) and phase modulation (PM) in terms of signal representation, FOM, and practical implementation.

**5. Attempt any one part of the following: 07 x 1 = 07**

a.	Describe how noise affects Amplitude Modulation (AM) systems. Derive an expression for the signal-to-noise ratio (SNR) in a coherent AM receiver.
b.	Explain the concepts of pre-emphasis and de-emphasis in FM systems. Derive how these techniques improve the SNR for high-frequency components of the modulating signal.

**6. Attempt any one part of the following: 07 x 1 = 07**

a.	Draw and explain block diagram of PCM. Also explain SNR in PCM.
b.	Define Delta Modulation and Time Division Multiplexing.

**7. Attempt any one part of the following: 07 x 1 = 07**

a.	Explain Phase Shift Keying and Frequency shift keying with help of waveform. Explain working of both.
b.	Explain Minimum Shift Keying (MSK) in detail.