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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

B.Tech-IV Semester (ECE/VLSI/ECE MINOR)

COURSE CODE (CREDITS): 25B11EC411/~~25B11EC417~~ (4) MAX MARKS: 25

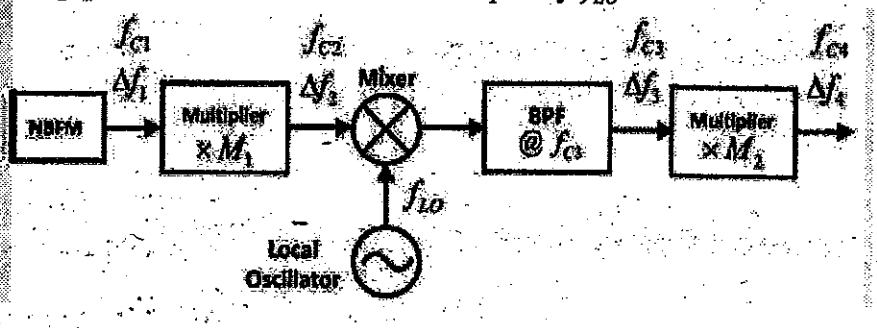
COURSE NAME: Analog and Digital Communication

COURSE INSTRUCTOR: Dr. Alok Kumar MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	Explain how NBFM is generated. Derive the time-domain representation of a single-tone frequency-modulated signal and represent its frequency-domain representation. An FM broadcast transmitter operates at its maximum frequency deviation of 75 KHz. Compute the extreme limits of the modulation index for modulating audio frequency range of 50 Hz to 15 KHz.	3	5
Q2	Compare AM with NBFM signals. Explain the Carson's rule for bandwidth computation. Consider an angle modulated signal $X_c(t) = 100\,Cos[2\pi f_c t + 5Sin(2\pi f_m t)]$. Assume FM and $f_m = 1kHz$. Compute the frequency modulation index and approximate bandwidth of FM signal.	3	4
Q3	In an Armstrong type FM generator, the crystal oscillator frequency is 200 KHz is employed to generate NBFM signal. The maximum phase deviation is limited to 0.2 to avoid distortion. Let frequency of message signal ranges from 50Hz to 15 KHz. The carrier frequency at the output (f_{c4}) is 108MHz. and the maximum frequency deviation (Δ_{f4}) is 75 kHz as shown in below Fig.1. Select the Frequency multiplier value and local oscillator frequency f_{LO}.  Fig.1	2	4

Q4	Define Frequency Division Multiplexing (FDM). What are the limitations of FDM in practical communication systems?	1	2
Q5	Draw the block diagram for an AM superheterodyne receiver and describe its operation and the primary function of each stage. Explain how image frequency signals are received in a AM superheterodyne receiver. How can these signals be rejected? For a broadcast superheterodyne AM receiver, determine the image frequency while considering the loaded Q at the input of the mixer is 90, bandwidth is 10 KHz and IF is 455 KHz.	3	5
Q6	What is flat-top sampling, and why does aperture error occur in flat-top sampling? The specified voice spectrum is 300 Hz to 3400 Hz and the sampling frequency used is 8KHz. In practice, the frequency spectrum of human voice extends much beyond the highest frequency necessary for communication. Let the input analog information signal also contains a 5KHz frequency component. What would happen at the output of the sampler? How can this problem be prevented?	4	5