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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-April 2022

B.Tech-IV Semester (ECE/CSE/IT)

COURSE CODE: 18B11EC413

MAX. MARKS: 25

COURSE NAME: Modern Analog and Digital Communication

COURSE CREDITS: 4

MAX. TIME: 1.5 Hours

*Note: All questions are compulsory. Marks are indicated against each question in square brackets. CO stands for Course Outcomes.*

**Q1(a).** Discuss the phase shift method for the generation of single side-band suppressed carrier (SSB-SC) modulated signal. CO-2 (2 marks)

**Q1(b). i)** How does the synchronous detector work for the demodulation of double side-band suppressed carrier (DSB-SC) modulated signal? CO-2

**ii)** Discuss the effect of phase and frequency errors in the demodulation process.

CO-2 (1+2=3 marks)

**Q2(a).** Theoretically, frequency modulated signal consists of infinite sidebands and hence infinite bandwidth. Justify this statement by deriving an expression. CO-2 (3 marks)

**Q2(b).** Discuss the merits and demerits of frequency modulation over amplitude modulation.

CO-2 (2 marks)

**Q3(a).** A 100 MHz carrier wave has a peak voltage of 5 volts. The carrier is frequency modulated by a sinusoidal modulating signal of frequency 2 kHz such that the frequency deviation is 75 kHz. The modulated waveform passes through zero and is increasing at  $t=0$ . Determine the expression for the modulated signal. CO-4 (2 marks)

**Q3(b).** For a modulating signal of 15 kHz, find a) the number of channels available in an MF band (300 kHz-3 MHz), when i) AM is used; ii) FM with a frequency deviation of 75 kHz is used. B) The maximum possible number of FM channels available in VHF (30 MHz-300 MHz). Band gap between the channels is assumed to be zero.

CO-4 (3 marks)

**Q4(a).** How can frequency modulated (FM) signal be generated using Armstrong method?

Discuss in detail.

CO-2 (3 marks)

**Q4(b).** Determine the frequency deviation, and carrier swing of a FM signal which has a resting frequency of 105 MHz & whose maximum frequency is 105.007 MHz when modulated by a particular wave. Also, find out the lowest frequency reached by the FM wave.

CO-2 (2 marks)

**Q5(a).** Discuss the functioning of Foster-Seeley discriminator for the demodulation of frequency modulated (FM) signal.

CO-2 (3 marks)

**Q5(b).** An angle modulated signal is represented by the expression:

$$S(t) = 10 \cos [10^8 t + 3 \sin 10^4 t]$$

i) Compute the frequency deviation.

ii) How much power is dissipated in 100  $\Omega$  resistor?

CO-2 (2\*1 = 2 marks)