Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Analog and Digital Communication **Semester: V**
Program: B.Tech. (Mechatronics) **Time: 03 hrs.**
Course Code: ECEG3054P **Max. Marks: 100**

Instructions: Attempt all the Questions

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	**Objective questions:** (a) The main advantage of superheterodyne receiver is: (i) Simple circuit (ii) better tracking (iii) improvement in selectivity and sensitivity (iv) better alignment (b) The modulation index of an AM wave is changed from 0 to1. The transmitted power is (i) unchanged (ii) halved (iii) increase by 50% (iv) quadrupled (c) A product modulator yields (i) Full AM signal (ii) DSB-SC signal (iii) VSB signal (iv) SSB signal (d) Following is not the purpose of modulation (i) Multiplexing (ii) effective radiation (iii) narrow-banding (iv) increase in signal power	**4 M**	**CO1**
Q 2	An FM radio link has frequency deviation of 30 kHz. The modulating frequency is 3kHz. Calculate the bandwidth needed for the link. What will be the bandwidth if the deviation is reduced to 15kHz.	**4 M**	**CO3**
Q 3	Differentiate cross-talk and intersymbol interference in communication.	**4 M**	**CO2**
Q 4	**Objective questions:** (a) Which of the following gives maximum probability of error (i) ASK (ii) FSK (iii) PSK (iv) DPSK (b) In FSK, no synchronous carrier is needed at the receiver (i) True (ii) False (c) Probability of error in DPSK is less than PSK (i) True (ii) False (d) Which of the following gives minimum probability of error (i) ASK (ii) FSK (iii) PSK (iv) DPSK	**4 M**	**CO1**
Q 5	Find the various frequency components and their amplitudes in the voltage given below: $v = 50(1 + 0.7cos5000t - 0.3cos1000t)sin5 * 10^6 t$ Also draw the single-sided frequency spectrum.	**4 M**	**CO3**

SECTION B **(4Qx10M= 40 Marks)**			
Q 6	What is the significance of noise in communication? Explain different types of noises in communication. Derive the expression of figure of merit for DSB-SC and SSB-SC system.	**10 M**	**CO2**
Q 7	Explain how FM is demodulated with suitable diagram using (a) Slope detector (b) Phase locked loop	**10 M**	**CO2**
Q 8	Explain how PAM signal is generated and detected using electronic circuits. **OR** Explain the following (a) Natural sampling and (b) Flat-top sampling	**10 M**	**CO2**
Q 9	What do you understand by PCM system. Draw the waveform of the following line codes for the binary word 10110011. (a) UNRZ (b) BNRZ (c) BNRZ (d) URZ (e) BRZ (f) Manchester Code (g) BRZ-AMI	**10 M**	**CO1**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	(a) An amplitude modulated amplifier has power output of 50W at 100% modulation and the internal loss in the modulator is 10W. (i) Calculate the unmodulated carrier power (ii) What power output is required from the modulator (iii) If 100% modulation is reduced to 75%. How much output is needed from the modulator. (b) An amplitude modulated wave is given by the following equation: $E = 15(1 + 0.7\cos(6000t) - 0.4\cos(10000t)) * \sin(5 * 10^6 t)$ Find the modulation index, amplitude of the carrier signal and modulating signal, lower and upper sideband frequencies.	**20M**	**CO3**
Q 11	(a) Design and explain the synchronous detection of FSK and PSK system. (b) An on-off binary system uses the pulse waveforms $s_i(t) = \begin{cases} s_1(t) = A\sin\frac{\pi t}{T}; 0 \le t \le T \\ s_2(t) = 0; 0 \le t \le T \end{cases}$ Let A =0.2mV and T=2μs. Additive white noise with a power spectral density $\frac{\eta}{2} = 10^{-15} W/Hz$ is added to the signal. Determine the probability of error when $P(s_1) = P(s_2) = \frac{1}{2}$.	**20M**	**CO4**