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| KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060 |
| EVEN SEMESTER 2022-2023 |
| CONTINUOUS ASSESSMENT TEST 1 - APRIL 2023 |
| (Regulations 2020) |

| Programme : B.Tech.,  Branch : **IT**  Semester: IV | Date : 21.04.2023  Time : 02:30 PM to 04:00 PM |
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| Course Code & Name:  **20ITT41 – Principle of Communication** | Duration: 1 ½ Hours  Max. Marks : 50 |

| **PART - A (10 × 2 = 20 Marks)** | | |
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| **ANSWER KEY** | | |
|  | Specify the advantage of angle modulation over amplitude modulation.  **1. Noise Immunity**  **2. Noise performance and signal to noise ratio improvement**  **3. Capture effect**  **4. power utilization and efficiency** | [CO2,K2] |
|  | When the modulating frequency in an FM system is 400Hz and the modulating voltage is 2.4V, the modulation index is 60. Calculate the maximum deviation. What is the modulation index when the modulating frequency is reduced to 250 Hz and modulating voltage simultaneously raised to 3.2V?  **Given: fm= 400Hz; Vm=2.4 V and M.I=60**   1. **𝜟f=? ; b. M.I =? If fm= 250Hz and Vm=3.2V**   **Solution:**  **a. 𝜟f= M.I \* fm= 60 \*400Hz= 24000Hz= 24KHz;**  **But 𝜟f = K1\*Vm=> K1= 𝜟f/ Vm = 24KHz/2.4V = 10000Hz/V**   1. **Now, M.I= K1\*Vm /fm= (10000Hz/V \*3.2V)/250Hz= 128** | [CO2,K3] |
|  | Draw the functional block diagram of phase looked loop. | [CO2,K2] |
|  | Show the frequency spectrum structure of angle modulation. | [CO2,K1] |
|  | Determine the deviation ratio (DR) and worst case bandwidth (BW) for FM signal with maximum frequency deviation is 25 KHz and the maximum modulation signal frequency is 12.5KHz.  **DR= 25KHz/12.5KHz= 2**  **BW=2(25KHz+12.5KHz)= 75KHz** | [CO2,K3] |
|  | Express the mathematical representation of amplitude shift keying and frequency shift keying modulated waves. | [CO3,K1] |
|  | Say any two characteristics of pulse code modulation and mention its applications.   1. **The analog signal is sampled and then converted to a serial n-bit binary code for transmission.** 2. **Each code has the same number of bits and requires the same length of time for transmission.** | [CO3,K2] |
|  | What is the necessity of digital signal transmission over analog signal transmission?  **Analog signals can always have more bandwidth than digital signals** | [CO3,K1] |
|  | Infer from the following figure for Frequency domain spectrum of frequency shift keying with input bit rate of 2 kbps.  C:\Users\Dell\Downloads\Untitled.jpg  Determine (a) the peak frequency deviation, (b) minimum bandwidth | [CO3,K3] |
|  | Identify the following shift keying signal A, B and C for the given input modulating signal and carrier signal.   | A | C:\Users\Dell\Downloads\151-1514631_ask-fsk-psk-modulation-hd-png-download.png | **Amplitude shift keying** | | --- | --- | --- | | B | C:\Users\Dell\Downloads\151-1514631_ask-fsk-psk-modulation-hd-png-download.png | **Frequency shift keying** | | C | C:\Users\Dell\Downloads\151-1514631_ask-fsk-psk-modulation-hd-png-download.png | **Phase shift keying** |   C:\Users\Dell\Downloads\151-1514631_ask-fsk-psk-modulation-hd-png-download.png | [CO3,K1] |

| Part – B (4 × 10 = 40 Marks) | | | |
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| ANSWER ANY FOUR QUESTIONS | | | |
| 11. | For an FM modulator has a carrier signal Vc(t)= 10sin(2π50000t) and a deviation sensitivity k1=10KHz/ and has the modulating signal Vm(t)= 4 sin(2π10000t). Use the given below the data table and Determine the following  Given: fc=50000Hz; fm= 10000Hz;  Vc=10V; Vm=4V and K1= 10KHz/V; R=10 Ω   1. The frequency deviation   **𝜟f = K1\*Vm = 10000 Hz/V\* 4V = 40000Hz**   1. Modulation index   **M.I= K1\*Vm /fm = 40000Hz/10000Hz= 4**   1. Deviation ratio   **DR= 𝜟f(max) /fm(max) = 4**   1. Bandwidth by Bessel rule :   **For M.I=4; n= 7**  **BW=2\*n\* fm =2\*7\* 10000Hz=140000Hz=140KHz**     1. Bandwidth by Carson rule   **BW= 2(𝞓f(max) +fm(max) )= 2\*(40KHz+10KHz)=50KHz**   1. Carrier power with loading resistance of 10Ω   **Pc = Vc2/R = 102/10** Ω **=10 Watts**   | Modulation Index | 0.25 | 0.5 | 1 | 1.5 | 2 | 2.4 | 2.5 | 3 | 4 | 5 | 6 | 7 | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Number of set sidebands | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | | (10) | [CO2,K3] |
| 12. | With neat circuit diagram explain the direct FM modulator and direct PM modulator using Varactor diode.  **Varactor diode FM Modulator:**   * **In reverse bias, when voltage( Modulating signal Amplitude) increases (positive) capacitance decreases ie., frequency increases.** * **In reverse bias, when voltage (Modulating signal Amplitude) decreases (Negative) capacitance increases ie., frequency decreases.**       **Varactor diode PM Modulator:**   * **When VD1 changes the capacitance, Modulating signal input directly changes the phase of the carrier signal** * **Limits the phase deviation, Non linear , Narrow band applications** | (10) | [CO2,K2] |
| 13. | State the definition of sampling theorem and aliasing effect. Also demonstrate with neat pictorial explanation.  **The sampling theorem states that a continuous-time signal needs to be uniformly sampled at a minimum rate in order to recover or reconstruct the original signal.**  fs≥2fm.  **Sampling frequency is the reciprocal of the sampling period. This sampling frequency can be simply called as Sampling rate. The sampling rate denotes the number of samples taken per second, or for a finite set of values.**  Sampling Theorem : Statement, Waveforms, Proof and Applications  C:\Users\Dell\Desktop\aa.bmp  **Aliasing: Aliasing is the effect of overlapping frequency components resulting from insufficiently large sample rate.**  C:\Users\Dell\Desktop\bb.bmp | (10) | [CO3,K3] |
| 14. | Describe the digital T Carrier system with relevant functional block diagrams.   * **Each T1 frame consists of 24 \* 8 = 192 bits + 1 bit for framing = 193 bits/frame.** * **There are 8000 frames generated per second (or 125 µsecond/frame).** * **The gross data rate of T1 = 8000 frames/sec \* 193 bits/frame = 1.544 Mbps** * **For transmitted digital data, the 24th channel is used for synchronization and is considered as overhead.** | (10) | [CO3,K2] |