Roll No.:.....

# National Institute of Technology, Delhi

Name of the Examination: B.Tech.

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| Branch | : ECE | Semester | :5th |
| Title of the Course | : Digital communication | Course Code | : ECB303 |

Time: 3 Hours | Maximum Marks: 50

Note :

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**Guidelines:**

**The question paper divided into three sections A, B and C and each section have following type of questions**

a. **Section A: Carry 5 parts and all parts are compulsory.**
b. **Section B: Contains Four (04) questions of 5 marks each.**
c. **Section C: Contains Two (02) questions of ten (10) marks each.**

## Section A

1. A Gaussian channel has 1.5MHz bandwidth. If the signal power-to-noise power spectral density ratio is $10^4$ Hz, determine the channel capacity C. **2**

2. Explain the terms of the 'Power bandwidth trade-off' possible in binary PCM system? Compare it with the trade-off possible in WBFM. **2**

3. With the help of a block diagram, explain the basic structure of binary baseband receiver. **2**

4. Given a polar NRZ binary data stream, how do you generate PSK signals? **2**

5. Draw the conditional density curves for binary '0' and binary '1' with $A_0$ and $A_1$ mean values. **2**

## Section B

6. The pulse rate (sampling) in a DM system is 56,000 per second. The input signal is $5\cos(2\pi 1000t) + 2\cos(2\pi 2000t)$ volts, with t in seconds. Find the minimum value of step-size which will avoid slope overload distortion. What could be the disadvantages of choosing a value larger than the minimum? What are the advantages and disadvantages of DM? **5**

7. What is DPSK? Write down an expression for the signal set. Draw the signal space diagram and show the signal constellation. **5**

8. Compare ASK, FSK and PSK modulation Techniques. **5**

9. A source is producing sequences of independent symbols A,B,C,D and E with the following probabilities A=1/2, B1/6, C=1/12, D=1/6, E=1/12. **5**
   i. Devise an unambiguous binary code for these symbols

ii. Compare the coding efficiency of your code.

## Section C

10. Explain PCM transmitter and Receiver. If a TV signal of 4.5 Mhz bandwidth is transmitted using 8-bit binary PCM, determine **10**
    i. The maximum signal to quantization noise ratio
    ii. The minimum bit rate
    iii. The min transmission bandwidth needed

11. A M-ary PSK system is to operate with $2^n$ symbols over a 100 kHz channel. The bit rate is required to be at least 750 kilobits/second. What minimum CNR is required if the bit-error probability should be equal to or better than $P_b=10^{-6}$? Assume ISI free conditions. And given $\text{erfc}(3.2) = 8\text{x}10^{-6}$. **10**