Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

FIRST SEMESTER M.TECH (DEAC) DEGREE END SEMESTER EXAMINATION
NOV/DEC 2015
SUBJECT: ADVANCED DIGITAL COMMUNICATION (ECE - 501)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ANY FIVE** full questions.
- Missing data may be suitably assumed.

1A. Find the pre-envelope for the signals (a) sinc(t) (b) $[1+k\cos(2\pi f_m t)]\cos(2\pi f_c t)$

1B. Find the amount of improvement in error probability relative to an un-coded (24, 12) double error correcting linear block code. The BPSK modulation is used with SNR of 10 dB.

1C. State and prove properties of Matched filter.

(5+3+2)

2A. Apply GSOP procedure to the set of signals given below to obtain orthonormal basis functions.

(a) $S_1(t) = A$ for $0 \le t \le 2$ (b) $S_2(t) = A$ for $0 \le t \le 1$ and -1 for $1 \le t \le 2$ (c) $S_3(t) = -A$ for $0 \le t \le 3$. All signals are having zero value elsewhere.

2B. The set of the codewords of a coding scheme are 000000, 101010, 010101 and 111111. If the received sequence over BSC channel is 111010 and ML decoder is used, what will be the decoded symbol?

2C. Explain Catastrophic error. Are rate ½ codes $1+X^4+X^6+X^7$ and $1+X^3+X^4$ Catastrophic ?

(5+3+2)

3A. Sketch the noise free response of optimum filter for the signal defined as $\varphi(t) = \begin{cases} A & 0 \le t \le \frac{T}{2} \\ -A & \frac{T}{2} \le t \le T \end{cases}$

3B. With an example, explain TCM error performance technique

3C. Write a note on synchronization issues in coherent detection.

(5+3+2)

4A. For the rate ⅔ convolution encoder shown in Figure 4A, 2 bits at a time are shifted. The constraint length is 2. Draw the tree and state diagrams.

4B. Explain how detection of signal with unknown phase in noise is employed using matched filter and hence derive for its error probability.

(6+4)

5A. Explain working principle of (a) MSK in detail and give its error probability (b) QAM

5B. Find the value of constant A, such that functions $\exp(-|t|)$ and $(1-A\exp(-2|t|))$ are orthogonal for the entire range.

(6+4)

6A. Explain the principle of working of QPSK modulator and demodulator and hence derive for probability of error.

6B. Consider a (7, 4) code with generator matrix $\begin{bmatrix} 1 & 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$. (a) Find all code words. (b) Find parity check matrix. (c) Find syndrome for received vector 1101101.Is this a valid code vector? (d) What is error correcting and detecting capability of the code?

(6+4)