Reg. No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (BIOMEDICAL ENGINEERING) END SEMESTER

MAKE UP EXAMINATIONS, JULY 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2203]

REVISED CREDIT SYSTEM

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.

❖ Each question carry equal marks

1A.	Use simplex method to solve $Maximize\ z = 6x + 4y$ $Subject\ to\ \ 2x + 3y \le 30$ $\qquad\qquad\ 3x + 2y \le 24$ $\qquad\qquad\ x + y \le 3$ $\qquad\qquad\ x,\ y \ge 0$	4
1B.	A coin is tossed 3 times. Let X denotes 0 or 1 according as a tail or a head occurs on the first toss. Let Y denote the number of tails which occur. Determine (i) Joint Probability distribution of X and Y (ii) Marginal Probability distribution of X and Y	3
1C.	Prove that $\int\limits_{-1}^{1} P_m(x)P_n(x)dx = 0\ \ for\ m \ne n$	3
2A.	Suppose that the life span of 2 electronic devices are distributions N(40, 36) and N(45, 9). If the electronic device is to be used for 45m period which device is to be preferred. If it is to be used for a 48m period which device is to be preferred.	4
2B.	Using the method of least squares, fit a straight line of the form $y = a + bx$ to the following data. 	x	0	1	3	6	8
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y	1	3	2	5	4		3
2C.	Two independent random variables X and Y have mean 5,10 and variance 4, 9 respectively. Find the covariance between $U = 3X + 4Y$ and $W = 3X - Y$.	3

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3A.	Use two phase method to solve $Maximize\ z = 3x - y$ $Subject\ to\ 2x + y \geq 2$ $\qquad\qquad x + 3y \leq 2$ $\qquad\qquad\quad y \leq 4$ $\qquad\quad x,\ y \geq 0$	**4**
3B.	Find mean and variance of Poisson distribution.	**3**
3C.	Prove that $J_n''(x) = \dfrac{1}{4}\left[J_{n-2}(x) - 2J_n(x) + J_{n+2}(x)\right]$	**3**
4A.	A random variable X has pmf $P\{X = k\} = \dfrac{c}{2^k}, k = 0,1,2,3,\ldots\ldots$. Find (i) c, (ii) cdf F(x), (iii) $P\{X\ is\ even\}$ and (iv) $P\{X \geq 5\}$	**4**
4B.	Prove that $\displaystyle\int J_3(x)dx = c - J_2(x) - \dfrac{2}{x}J_1(x)$	**3**
4C.	A and B roll alternatively a pair of fair dice. A wins if he throws a sum 6 before B throws a sum 7. B wins if he throws sum 7 before A throws sum 6. A begins the game. The game can continue indefinitely. Find A's chances of winning.	**3**
5A.	Prove that $(i)\quad (n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$ $(ii)\quad nP_n(x) = xP_n'(x) - P_{n-1}'(x)$	**4**
5B	A bag contains 3 coins. One of which is coined with 2 heads and the other two coins are normal and unbiased. A coin is chosen at random from the bag and tossed 4 times in succession. If head appear each time, what is the probability that this is a two headed coin?	**3**
5C.	Use graphical method to solve $Maximize\ z = 3x + 5y$ $Subject\ to\ 3x + 2y \leq 18$ $\qquad\qquad\quad x \leq 4$ $\qquad\qquad\quad y \leq 6$ $\qquad\quad x,\ y \geq 0$	**3**