Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL A Constituent Institution of Manipal University

## FOURTH SEMESTER B.TECH. (BIOMEDICAL ENGINEERING) END SEMESTER MAKE-UP EXAMINATIONS, JUNE 2017 SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2203] REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.

1A.	<ul> <li>Six girls are to enter a dance with 10 boys to form a ring so that every girl is between two boys.</li> <li>(i) What is the probability that some specified boy remains between two boys?</li> <li>(ii) What is the probability that a certain girl dances with a certain boy?</li> </ul>	3M
1 <b>B</b> .	A coin is known to come up 3 times head as often as tail. Coin is tossed 3 times. Let X denote number of heads that appear. Write the probability distribution of heads and cdf.	3M
1C.	Three balls are randomly selected from an urn containing 3 white, 3 red and 5 black balls. The person who selects the ball wins \$1.00 for each white ball selected and loose \$1.00 for each red ball selected. Let X be the total winning from the experiment. Find the probability distribution of X.	<b>4</b> M
2A.	Find the mean of a random variable X with pdf $f(x) = \begin{cases} x e^{-\frac{x^2}{2}}, & x \ge 0 \\ 0, & elsewhere \end{cases}$	3M
2B.	The two dimensional random variable (X, Y) has the joint pdf given by $f(x,y) = \begin{cases} 6e^{-2x-3y}, & x, & y \ge 0\\ 0, & elsewhere \end{cases}$ (i) $P(1 < X < 2, & 2 < Y < 3)$ (ii) $P(0 < X < 2, & Y > 2)$	3M

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	Let $X_1$ , $X_2$ and $X_3$ be uncorrelated random variables having the same			
2C.	standard deviation. Find the correlation coefficient between $X_1 + X_2$ and			
	$X_2 + X_3.$			
3A.	Two dice are thrown. Let X denote sum of numbers showing up. Verify	3М		
	Chebyshev's inequality for $P\{ X - 7  \ge 3\}$	JIVI		
	Using the method of least squares, fit a straight line of the form $y = a + a$			
2D	bx to the following data.			
<b>3B</b> .	x 1.0 1.2 1.4 1.6 1.8 2.0	JIVI		
	y 0.45 0.55 0.60 0.70 0.80 0.85			
<b>3C.</b>	Prove that $J_0^2 + 2J_1^2 + 2J_2^2 + 2J_3^2 + 2J_4^2 + \dots = 1$			
<b>4</b> A.	• Prove that $J_{-5/2}(x) = \sqrt{\frac{2}{\pi x}} \left\{ \frac{3-x^2}{x^2} \cos x + \frac{3}{x} \sin x \right\}$			
<b>4B.</b>	Prove that $P_n(x) = \frac{1}{n!2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$	<b>3</b> M		
	Use Big M method to solve			
	$Minimize \ P = 4x + y$	nize P = 4x + y		
10	Subject to $3x + y = 3$	<b>4M</b>		
40.	$4x + 3y \ge 6$			
	$x + 2y \le 4$			
	$x, y \ge 0$			
	Use simplex method to solve			
	$Maximize \ P = x - 3y + 3z$			
5.4	Subject to $3x - y + 2z \le 7$			
54.	$2x + 4y \ge -12$	JIVI		
	$-4x + 3y + 8z \le 10$			
	$x, y, z \ge 0$			
	The heights of 500 soldiers are found to have normal distribution. Of them,			
<b>5B.</b>	258 are found to be within 2 cm of the mean height of 170 cm. Find the	<b>3M</b>		
	standard deviation of X.			
	Six fair coins are tossed. Find the probability of getting			
5C.	I. Exactly 3 heads			
	II. Atmost 3 heads			
	III. Atleast 3 heads			
	IV. Atleast 1 head			