Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (BIOMEDICAL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

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 suitable assumed.

1A.	The co-efficients a, b and c of the quadratic equation $ax^2+bx+c=0$ are determined by throwing a dice three times. Find the probability that the roots are real.	**4**
1B.	Solve the following LPP by simplex method $Minimize\ P=x-3y+3z$ $Subject\ to\ 3x-y+2z\le 7$ $2x+4y\ge -12$ $-4x+3y+8z\le 10$ $x,\ y,\ z\ge 0$	**3**
1C.	A coin is tossed till a first head appears or a total of n tosses are made. Let X denote the number of tosses. Find the distribution of X. Also find the mean.	**3**
2A.	Use Big M method to solve $Maximize\ P=3x+2y+3z$ $Subject\ to\ 2x+y+z\le 2$ $3x+4y+2z\ge 8$ $x,\ y,\ z\ge 0$	**4**
2B.	The marks obtained by 10 students in statistics and maths are given below. Find the coefficient of correlation and the two regression lines. <table><tr><td>Marks in statistics</td><td>75</td><td>30</td><td>60</td><td>80</td><td>53</td><td>15</td><td>40</td><td>38</td><td>48</td><td>35</td></tr><tr><td>Marks in Maths</td><td>45</td><td>54</td><td>91</td><td>58</td><td>63</td><td>35</td><td>43</td><td>45</td><td>44</td><td>85</td></tr></table>	**3**
2C.	Prove that $J_{-\frac{1}{2}}(x)=\sqrt{\frac{2}{\pi x}}\cos x$ and $J_{\frac{1}{2}}(x)=\sqrt{\frac{2}{\pi x}}\sin x$. Hence deduce that $J_{-\frac{1}{2}}^{\,2}(x)+J_{\frac{1}{2}}^{\,2}(x)=\frac{2}{\pi x}$	**3**

Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

3A.	Prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0,\ when\, \alpha \neq \beta$. Where $\alpha\ and\ \beta$ are roots of $J_n(x)=0$.	**4**
3B.	If X_1, X_2, X_3 be uncorrelated random variables having the same standard deviation. Find the correlation coeffecient between $X_1 + X_2$ and $X_2 + X_3$.	**3**
3C.	The diameter of an electric cable is normally distributed with mean 0.8 and variance 0.0004. What is the probability that the diameter exceeds 0.81 inches? Suppose that the cable is defective, if its diameter differs from its mean by more than 0.025 inches. What is the probability of obtaining a defective cable?	**3**
4A.	Solve using two phase method $Minimize\ \ P = 7.5x - 3y$ $Subject\ to\ 3x - y - z \geq 3$ $x - y + z \geq 2$ $x,\ y,\ z \geq 0$	**4**
4B.	Show that $\int_{-1}^{1} x^2 P_{n-1}P_{n+1}dx = \dfrac{2n(n+1)}{(2n-1)(2n+1)(2n+3)}$	**3**
4C.	An office has 4 secretaries handling 20%, 60%, 15% and 5% of files of government reports. The probability that they misfile such reports are respectively 0.05, 0.1, 0.1 and 0.05. Find the probability that a misfiled report can be blamed on first secretary.	**3**
5A.	Suppose the joint pdf of a 2-dimensional random variable is given by, $f(x,y) = \begin{cases} x^2 + \dfrac{xy}{3}, & 0<x<1, \quad 0<y<2 \\ 0, & elsewhere \end{cases}$ Compute the following $(i) P\left(X > \frac{1}{2}\right)$ $(ii)\ P\left(X+Y \geq 1\right)$	**4**
5B.	Prove that $P_n(x) = \dfrac{1}{n!2^n}\dfrac{d^n}{dx^n}\left(x^2-1\right)^n$	**3**
5C.	Suppose that 0.01% of the population in a city with population 10,000 suffer from a particular disease. Find the probability that (i) there are no persons, (ii) there is atleast one person suffering from the disease. If there are 10 such cities, what is the probability that atleast one city will have atleast one person who suffers from the disease.	**3**