Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (BIOMEDICAL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2203]

REVISED CREDIT SYSTEM

(23-04-2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	If the letters of the word REGULATIONS are arranged at random, What is the probability that there will be exactly 4 letters in between R and E?	**3M**
1B.	The chance that a doctor A will diagnose a disease correctly is 60%. The chance that a patient will die after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. If a patient of A dies what is the chance that his disease was correctly diagnosed?	**3M**
1C.	Three balls are randomly selected from an urn containing 3 white, 3red and 5 black balls. The person who selects the ball wins $ 1.00 for each white ball selected and loses $ 1.00 for each red ball selected. Let X is the total winnings from the experiment. Find the probability distribution	**4M**
2A.	A pair of fair dice are rolled. What is the probability that sum 6 appear before sum 7?	**3M**
2B.	A student takes a multiple choice test consisting of 2 problems. The first one has 3 possible answers and the second one has 5. The student choses at random, one answer as the right answer for each of the two problems. Let X denote the number of right answers of the student. Find variance.	**3M**
2C.	If X and Y are independent random variables and marginal pdf of X is $g(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & elsewhere \end{cases}$. The marginal pdf of Y is $h(y) = \begin{cases} 1, & 0 < y < 1 \\ 0, & elsewhere \end{cases}$ Compute $P\left\{\lvert X - Y\rvert \leq \frac{1}{4}\right\}$ and $P\{Y \geq X^2\}$	**4M**
3A.	Two independent random variables X and Y have mean 5, 10 and variance 4, 9 respectively. Find the correlation coefficient between $U = 3X + 4Y$ and $W = 3X - Y$	**3M**

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3B.	Fit a parabolic curve $y = ax^2 + bx + c$ to the following data x: 0, 1, 2, 3, 4, 5, 6 y: 14, 18, 23, 29, 30, 40, 46	**3M**
3C.	Show that $P_n(x) = \sum_{r=0}^{N} \frac{(-1)^r (2n-2r)!}{2^n r!(n-r)!(n-2r)!} x^{n-2r}$ .Hence deduce that $P_n(-x) = (-1)^n P_n(x)$	**4M**
4A.	Prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x)\, dx = 0$, *when* $\alpha \neq \beta$. Where α *and* β are roots of $J_n(x) = 0$.	**3M**
4B.	Prove that $J_n(x) = \frac{x}{2n}[J_{n-1}(x) + J_{n+1}(x)]$.	**3M**
4C.	Use Big M method to solve *Minimize* $z = 2x + y$ *Subject to* $3x + y = 3$ $4x + 3y \geq 6$ $x + 2y \leq 3$ $x,\ y \geq 0$	**4M**
5A.	Use simplex method to solve *Maximize* $Z = 10x + y$ *Subject to* $x + y \leq 10$ $4x + y \leq 20$ $x + 2y \leq 30$ $x,\ y \geq 0$	**3M**
5B.	In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance.	**3M**
5C.	Suppose that suicide rates in a certain state is 4 suicides for 1 million inhabitants per month. Find the probability that in a certain town with population 5 lakh there would be atmost 4 suicides per month. What is the probability that during a year there are atleast 2 months in which more than 4 suicides occur?	**4M**