Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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IV SEMESTER B.TECH. (MECHATRONICS)

MAKE UP END SEMESTER EXAMINATIONS, JUNE/JULY 2017

SUBJECT: ENGINEERING MATHEMATICS-IV [MAT 2211]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX MARKS: 50

Instructions to Candidates:

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

1A.	Suppose that the two dimensional random variable (X, Y) is uniformly distributed over the triangular region R = {(x, y)/0<x<y<1}. (i) Find its pdf. (ii) Find the correlation coefficient.	4
1B.	For a normally distributed population 7% of the items have their values less than 35 and 89% have their values less than 63. Find the mean and standard deviation of the distribution.	3
1C	Three bags X, Y and Z contain 6 green and 4 red balls; 2 green and 6 red balls; 1 green and 8 red balls respectively. Two balls are drawn at random from one of the bags. If both the balls are found to be red, then what is the probability that they came from bag X?	3
2A.	Fit a parabola to the following data. X: 0, 1, 2, 3, 4 Y: 1, 1.8, 1.3, 2.5, 2.3	4
2B.	Solve the difference equation $y_{n+2} - 2y_{n+1} + 4y_n = 2^n$.	3
2C.	Obtain the power series solution of the equation $(1-x^2)y'' - xy' + 4y = 0$.	3
3A.	Solve the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$ with $y_0 = 0, y_1 = 1$ using Z - Transform.	4
3B.	Find the mean and variance of Binomial distribution.	3
3C.	State and prove Bayes Theorem	3

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4A.	The diameter of an electric cable say X is assumed to be a continuous random variable with pdf, $f(x)=\begin{cases} 6x(1-x); 0 \le x \le 1 \\ 0 \quad ; elsewhere \end{cases}$ (i) Check that the above is a pdf. (ii) Obtain the expression for cumulative distribution function. (iii) Determine a number 'b' such that P(X < b) = 2P(X ≥ b). (iv) Compute $P\left(X \le \frac{1}{2} \middle| \frac{1}{3} < X < \frac{2}{3}\right)$.	4
4B.	Find the M.G.F. of Gamma distribution. Hence find E(X).	3
4C.	Find the Z-transform of $\frac{1}{n!}$ and hence deduce $Z\left(\frac{1}{(n+1)!}\right)$.	3
5A.	Prove that $(i)\frac{d}{dx}[x^n J_n(x)] = x^n J_{n-1}(x)$	4
5B.	Apply Chebyshev's inequality to calculate $(i)P(5 < X \le 15)$ $(ii)P(\lvert X-10\rvert \ge 3)$ for a random variable X with $\mu = 10$ and $\sigma^2 = 4$.	3
5C.	Find the pdf of $Y = 8X^3$ if X has the pdf $f(x)=\begin{cases} 2x; 0 \le x \le 1 \\ 0; elsewhere \end{cases}$.	3