Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (ELECTRONICS AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, MAY/JUNE 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2207]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

Answer **all** the questions.

1A.	Find i) $z^{-1}\left\{\frac{z^2}{(z+2)(z^2+4)}\right\}$ ii) $z\{\cos(\frac{n\pi}{2}+\frac{\pi}{4})\}$	**3**
1B.	Solve $x^2y'' + xy' + (x^2-3)y = 0,\ y(1) = 0,\ y(2) = 2$ with h = 0.25	**3**
1C.	Urn 1 contains 7red and 6 black balls. Urn 2 contains 6 red and 7 black balls. Three balls are selected at random from urn 1 and transferred to urn 2. Then a ball is selected from urn2. What is the probability that the ball is red? If the chosen ball is red, what is the probability that two red and one black ball are transferred from urn 1 to urn 2?	**4**
2A.	Solve the difference equation $y_{n+2} + y_{n+1} - 56y_n = 2^n(n^2-3)$.	**3**
2B.	A random variable X takes values -1, 0, 1 with probabilities 1/8, 3/4, 1/8 respectively. Evaluate $P(\|X-\mu\| \geq 2\sigma)$ and compare it with upper bound using by Chebyshev's inequality.	**3**
2C.	i)If X is uniformly distributed in the interval (0, 1) then find the p.d.f of $Y=8X^3$. ii) Compute an approximate probability that the mean of a random sample of size 15 from a distribution having p.d.f $f(x) = \begin{cases} 3x^2, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ is between 3/5 and 4/5.	**4**
3A.	Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$, $0 < x < 1$, $t > 0$, $u(x, 0) = 1 - x^2$, $u(1, t) = 0$, $u(0, t) = 1 - t^2$, $\frac{\partial u}{\partial t}(x, 0) = 0$, choosing h = 0.25, compute u for 3 time steps.	**3**
3B.	A& B throw alternatively with a pair of balanced dice. A wins if he throws a sum six points before B throws a sum of seven points. B wins if he throws a sum of seven	**3**

	points before A throws a sum of six points. If A begins the game, find his probability of winning.	
3C.	Fit a parabola $Y= a+bX+cX^2$ for the following data X: 0, 1, 2, 3, 4, 5, 6 Y: 14, 18, 23, 29, 30, 40, 46	**4**
4A.	A two dimensional continuous random variable (X,Y) has joint probability density function $f(x,y) = \begin{cases} \frac{e^{-y}}{2}, & y > \lvert x \rvert \\ 0, & \text{elsewhere} \end{cases}$ Find the correlation coefficient between X and Y.	**3**
4B.	If X and Y are independent and their marginal p. d. fs are given by $f(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ and $g(y) = \begin{cases} 1, & 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$ Find i) $P(\lvert X - Y \rvert \leq 1/4)$ ii) $P(Y \geq X^2)$.	**3**
4C.	In an examination, the marks scored by the students follow the normal distribution. It is known that, a student passes the examination if he secures 40% or more marks. He is placed in first, second and third division if he secures 60% or more, between 50% and 60% and between 40% and 50% marks respectively. He gets a distinction if he gets 70% or more marks. It is given that 10% of the students have failed in the examination and 5% of them obtained distinction. Find the percentage of the students placed in the second division.	**4**
5A.	Suppose that X has p.d.f $f(x) = \frac{e^{-\lvert x \rvert}}{2}$, $-\infty < x < \infty$. Find moment generating function of X. Using mgf, find E(X) and V(X).	**3**
5B.	A continuous random variable X has the cumulative distribution function $F(x) = \begin{cases} 0 & x \leq 1 \\ k(x-1)^4 & 1 < x \leq 3 \\ 1 & x > 3 \end{cases}$ Find (i) k (ii) Mean (iii) Mode	**3**
5C.	The two independent random variables X_1 and X_2 having pdf's $f(x_1) = e^{-x_1}$, $0 \leq x_1 < \infty$ and $g(x_2) = e^{-x_2}$, $0 \leq x_2 < \infty$. Obtain the pdf of $Z = \frac{X_1}{X_2}$.	**4**