Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (MECHANICAL ENGINEERING)

MAKE-UP END SEMESTER EXAMINATIONS, JUNE 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2210]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Fit a parabola $y = a + bx + cx^2$ to the following data x: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 2.3	**4**
1B.	A tea set has four sets of cups and saucers. Two of these are of one colour and the other two sets are of different colours. If the cups are placed at random on the saucers then what is the probability that no cup is on a saucer of the same colour?	**3**
1C.	Three bags X, Y and Z contain respectively 6 green and 4 red balls; 2 green and 6 red balls; 1 green and 8 red balls. 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.	The p.d.f. of a continuous random variable X is given by $f(x) = ke^{-\|x\|}$ for $-\infty < x < \infty$ then (i) find k. (ii) find $E(X)$ and $V(X)$.	**4**
2B.	Prove that $J_n'(x) = \frac{1}{2}\left[J_{n-1}(x) - J_{n+1}(x)\right]$	**3**
2C.	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**

3A.	Obtain the Frobenious type series solution of the equation $2x\frac{d^2y}{dx^2}+3\frac{dy}{dx}-y=0$	**4**
3B.	In 256 sets of 12 tosses of an unbiased coin, in how many cases one can expect 8 heads and 4 tails?	**3**
3C.	A distribution with unknown mean for μ has variance for $\sigma^2=1.5$. How large a sample should be taken from the distribution in order that probability will be at least 0.95, that the sample mean will be with in 0.5 of the population mean.	**3**
4A.	A coin is tossed three times. Let $X=0$ or 1 according as a head or a tail occurs on the first toss. Let Y be equal to the total number of heads which occur. Find (i) The joint p.d.f. of X and Y (ii) $COV(X,Y)$	**4**
4B.	If X and Y are two independent random variables with p.d.f.'s $f(x)=e^{-x}$ for $x>0$ and $g(y)=2e^{-y}$ for $y>0$ respectively then find the p.d.f. of $Z=X+Y$.	**3**
4C.	If the random variable 'K' is uniformly distributed over $(0,5)$ then what is the probability that the roots of the equation $4x^2+4xk+k+2=0$ are real.	**3**
5A.	Find the m.g.f. of the random variable X with p.d.f. $P(X=k)=q^{k-1}p$ for $k=1,2,3,...$ with $p+q=1$. Hence find $E(X)$ and $V(X)$.	**4**
5B.	Express $f(x)=x^4+3x^3-x^2+5x-2$ in terms of Legendre polynomials.	**3**
5C.	Let X be random variable with probability distribution $$f(x)=\frac{1}{\pi(1+x^2)} \text{ for } -\infty<x<\infty.$$ Then find the p.d.f. of $Y=\frac{1}{X}$.	**3**