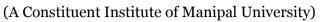
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Manipal Institute of Technology, Manipal





## IVSEMESTER B.TECH (AERONAUTICAL ENGINEERING) END SEMESTER MAKEUP EXAMINATION, JUNE 2016

## SUBJECT: ENGINEERING MATHEMATICS -IV [MAT2201]

## **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

andidates:

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

1A.	Suppose that the joint probability distribution function of $(X, Y)$ is given by $f(x, y) = \begin{cases} e^{-y} & x > 0, y > x \\ 0 & otherwise \end{cases}$ i. Find the marginal pdf of X and Y ii. Evaluate $P\{X > 2/Y < 4\}$ iii. Check whether they are independent	(4)			
1B.	Fit a curve of the form $y = a + bx + cx^2$ for the following data using least square principle. $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(3)			
1C.	A and B roll alternatively a pair of fair dice. A wins if he throws a sum 6 before B throws a sum 7. B wins if he throws sum 7 before A throws sum 6. A begins the game. The game can continue indefinitely. Find A's chance of winning.	(3)			
2A.	Two cards are selected at random from a box which has 5 cards numbered 1, 1, 2, 2, 3. Find the joint probability distribution of X and Y, where X denotes sum of 2 numbers and Y denotes maximum of 2 numbers drawn. Find correlation coefficient $\rho_{XY}$ .				
2B.	Calculate mean, mode and median of the following data:         Weight(in gms) $0 - 10$ $10 - 20$ $20 - 30$ $30 - 40$ $40 - 50$ $50 - 60$ No. of articles       14       17       22       26       23       18	(3)			

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2C.	Show that Poisson distribution is the limiting case of binomial distribution.	(3)
3A.	Prove that: i. $\int J_3(x) dx = c - [J_2(x) + \frac{2}{x}J_1(x)]$ ii. $J_n''(x) = \frac{1}{4} \{J_{n-2}(x) + J_{n+2}(x) - 2J_n(x)\}$	(4)
3B.	Suppose X is a random variable which is uniformly distributed in an interval (1,3). Find the pdf of X and obtain the pdf of the random variables (i) $Y = 4 - X^2$ (ii) $Z = e^X$	(3)
3C.	Define $\chi^2$ distribution and find its mean and variance using moment generating function.	(3)
4A.	A set of examination marks is approximately normally distributed with mean 75 and standard deviation 5. If the top 5% of the students get grade A and bottom 25% get grade B, what mark is a lowest A and what mark is highest B?	(4)
4B.	Show that $x^4 - 3x^2 + x = \frac{8}{35}P_4(x) - \frac{10}{7}P_2(x) + P_1(x) - \frac{4}{5}P_0(x)$ . using Legendre polynomial.	(3)
4C.	State central limit theorem. If $\overline{X}$ be the sample mean of random sample size <i>n</i> from $N(\mu, 100)$ distribution. Find <i>n</i> such that $P(\mu - 5 < \overline{X} < \mu + 5) = 0.954$	(3)
5A.	Solve the equation in series $x^2y'' + xy' + (x^2 - n^2)y = 0$ where <i>n</i> is not an integral or zero.	(4)
5B.	The sum and product of the mean and variance of a binomial distribution are 24 and 128. Find the distribution completely.	(3)
5C.	Suppose that there is a chance of for a newly constructed house to collapse whether the design is faulty or not. The chance that the house is faulty is 10%. The chance that the house collapses if the design is faulty is 95% and otherwise it is 45%. It is seen that the house collapsed. What is the probability that it is due to faulty design?	(3)