Reg. No.

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

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

Instructions to Candidates:

- 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.

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

(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 ρ_{XY}.

(4)

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)

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 χ^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 $\bar{X}$ be the sample mean of random sample size n from $N(\mu, 100)$ distribution. Find n such that $P(\mu - 5 < \bar{X} < \mu + 5) = 0.954$	**(3)**
5A.	Solve the equation in series $x^2y'' + xy' + (x^2 - n^2)y = 0$ where n 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)**