Reg. No.									

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (BIOTECHNOLOGY / CHEMICAL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY - JUNE 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2204]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Solve $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0,\ u(x,0)=x^2+2x,\ u(0,y)=-2y-y^2,$ $u(x,4)=x^2+2x-24,\ \ u(4,y)=24-y^2-2y,$ by standard five point formula with $h=1.$	**4 Marks**
1B.	Three machines A, B and C produce identical bolts. Of their outputs 5%, 4% and 3% of bolts were defective. On a certain day, A produces twice as many bolts as B while B and C produce equal number of bolts. A bolt selected at random is found to be defective. What is the chance that it was produced by A or B?	**3 Marks**
1C.	Using the Z-transform, solve $y_{n+2}+4y_{n+1}+3y_n=3^n$ with $y_0=0,\ y_1=1.$	**3 Marks**
2A.	Solve $\frac{d^2y}{dx^2}+y+x=0,\ y(0)=y(1)=0$, by Rayleigh-Ritz method (use a two parameter approximation).	**4 Marks**
2B.	Fit a least square straight line y = ax + b to the following data: x: 1, 2, 3, 5, 6 y: -2, 0, 8, 14, 15	**3 Marks**
2C.	A problem in mechanics is given to three students A, B, and C whose chances of solving it are $\frac{1}{2},\ \frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?	**3 Marks**

Reg. No.									

प्रज्ञानं ब्रह्म
Manipal
INSPIRED BY LIFE

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

KNOWLEDGE IS POWER
MANIPAL INSTITUTE OF TECHNOLOGY

3A.	Suppose that the continuous two-dimensional random variable (X, Y) is uniformly distributed over the region bounded by the triangle whose vertices are (1, 0), (0, 1) and (-1, 0). Find the marginal pdf's of X and Y. Are they independent? Justify your answer.	**4 Marks**
3B.	Use Simplex method to solve the LPP: Maximize $z = 10x_1 + x_2 + 2x_3$ Subject to $x_1 + x_2 - 2x_3 \le 10,\ 4x_1 + x_2 + x_3 \le 20,\ x_1,\ x_2,\ x_3 \ge 0$.	**3 Marks**
3C.	Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2},\ u(0,t) = u(1,t) = \frac{\partial u}{\partial t}(x,0) = 0,\ u(x,0) = \sin^3 \pi x, 0 \le x \le 1,$ with $h = 0.25,\ k = 0.2$ for two time steps.	**3 Marks**
4A.	Use two phase method to solve the following L.P. problem: Minimize $z = x_1 + x_2$ subject to $2x_1 + x_2 \ge 4,\ x_1 + 7x_2 \le 7,\ x_1,\ x_2 \ge 0$.	**4 Marks**
4B.	Solve $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x^2,\ y\left(\frac{4}{3}\right) = \frac{52}{27},\ y\left(\frac{8}{3}\right) = \frac{136}{27},\ h = \frac{1}{3}$.	**3 Marks**
4C.	The incidence of occupational disease in an industry is such that the workmen have a 10% chance of suffering from it. What is the probability that in a group of 70, eight or more will suffer from it on at least three days of a week?	**3 Marks**
5A.	Use graphical method to Maximize $z = 5x_1 + 4x_2$ subject to $6x_1 + 4x_2 \le 24,\ x_1 + 2x_2 \le 6,\ -x_1 + x_2 \le 1,\ x_2 \le 2,\ x_1 \ge 0,\ x_2 \ge 0$.	**4 Marks**
5B.	The age of thermostats of a particular make follow the normal distribution with mean 5 years and standard deviation 2 years. Out of 10000 units sold, how many of them will have to be replaced after the second year?	**3 Marks**
5C.	Find the Z-transform of $(n+1)^2 + ne^{2n}$.	**3 Marks**