Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (CHEMICAL/BIOTECH)

END SEMESTER MAKEUP EXAMINATIONS, JUNE-2018

SUBJECT: ENGINEERING MATHEMATICS-IV [MAT 2204]

REVISED CREDIT SYSTEM
(/06/2018)

Time: 3 Hours MAX MARKS: 50

Instructions to Candidates:

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

1A.	Suppose that the continuous two random variable (X, Y) is uniformly distributed over the region whose vertices (1, 0), (0, 1), (-1, 0) and (0, -1). Find the marginal pdf's of X and Y.	**4**
1B.	Solve $(x^3+1)y''+x^2y'-4xy=2,\ y(0)=0, y(2)=4,\ h=0.5$ by finite difference method.	**3**
1C	Companies A, B, C produces 30%, 45%, 25% of cars respectively. It is known that 2%, 5%, 2% of the cars produced by A, B, C are defective. If a car is purchased and found to be defective. What is the probability that this car is produced by company A?	**3**
2A.	Solve $\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2}, 0<x<1,\ t>0,$ subjected to $u(x,0)=100(x-x^2),$ $u(1,t)=0=u(0,t),\ \frac{\partial u}{\partial t}(x,0)=0$ with $h=0.25$ for 4 time steps.	**4**
2B.	For a normally distributed population 31% of the items have their values less than 45 and 8% have their values greater than 64. Find the mean and standard deviation of the distribution.	**3**
2C.	Given $f(x)=\begin{cases} 4x^3; 0<x<1 \\ 0; elsewhere \end{cases}$ (a) Find P(X > 0.8) (b) Find P(X < ½) (c) Find cdf.	**3**
3A.	Solve the following L.P.P. using simplex method: Maximize $Z=5x_1+3x_2;$ subject to $x_1+x_2\le 2;\quad 5x_1+2x_2\le 10;\quad 3x_1+8x_2\le 12,\ \ x_1,x_2\ge 0.$	**4**
3B.	Find (i) $Z(coshn\theta)$ (ii) $Z(nsinn\theta)$	**3**

<table>
<tr><td>3C.</td><td>Using Crank-Nicolson’s method, solve $\frac{\partial u}{\partial t} = 16\frac{\partial^2 u}{\partial x^2}, 0 < x < 1,$ subjected to $u(x,0) = 100\ sin\pi x,\ u(1,t) = 0 = u(0,t)$ with $h = 0.25$ for 2 time steps.</td><td>3</td></tr>
<tr><td>4A.</td><td>Fit a parabola to the following data:
<table>
<tr><td>X:</td><td>1</td><td>2</td><td>3</td><td>4</td><td>6</td><td>8</td></tr>
<tr><td>Y:</td><td>2.4</td><td>3</td><td>3.6</td><td>4</td><td>5</td><td>6</td></tr>
</table></td><td>4</td></tr>
<tr><td>4B.</td><td>If A and B are two independent events of S, such that $P(\overline{A}\cap B) = \frac{2}{15}, P(A\cap \overline{B}) = \frac{1}{6},$ then find $P(B)$.</td><td>3</td></tr>
<tr><td>4C.</td><td>The Handy-Dandy company wishes to schedule the production of a kitchen appliance that requires two resources – labour and material. The company is considering three different models and its production engineering department has furnished the following data:
<table>
<tr><td>Model:</td><td>A</td><td>B</td><td>C</td><td>Max. time available(hrs)</td></tr>
<tr><td>Labour (hours per unit):</td><td>7</td><td>3</td><td>6</td><td>10</td></tr>
<tr><td>Material (pounds per unit):</td><td>4</td><td>4</td><td>5</td><td>15</td></tr>
<tr><td>Profit ($ per unit):</td><td>4</td><td>2</td><td>3</td><td></td></tr>
</table>
The problem is to determine the optimum daily production for three models that maximize the profit. Formulate a L.P.P.</td><td>3</td></tr>
<tr><td>5A.</td><td>(i) If X, Y and Z are uncorrelated random variables with standard deviation 5, 12 and 9 respectively. If U = X + Y and V = Y + Z, evaluate the correlation coefficient between U and V.</td><td>4</td></tr>
<tr><td>5B.</td><td>Using graphical method, solve the following L.P.P.:
Maximize $Z = 2x_1 + 3x_2$; subject to $x_1 - x_2 \leq 2$; $x_1 + x_2 \geq 4$; $x_1, x_2 \geq 0$.</td><td>3</td></tr>
<tr><td>5C.</td><td>Find the mean and variance of Poisson distribution.</td><td>3</td></tr>
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