Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
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IV SEMESTER B.TECH. (CHEMICAL/BIOTECH)

END SEMESTER MAKE UP EXAMINATIONS, MAY 2017

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 suitable assumed.

1A.	Solve $xy'' + y = 0, y(1) = 1, y(2) = 2$ and $h = 0.25$ by finite difference method.	**3**
1B.	Solve the difference equation $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$	**3**
1C	A two dimensional random variable has a joint pdf $f(x) = \begin{cases} x^2 + \frac{xy}{3}, & 0 < x < 1, 0 < y < 2 \\ 0 & elsewhere \end{cases}$ Evaluate (i) $P(X > {}^{1}/_{2})$ (ii) $P(Y < X)$ (iii) $P(X + Y \geq 1)$	**4**
2A.	Find the maximum value of $Z = 2x + 3y$ subject to the constraints $x + y \leq 30, y \geq 3, 0 \leq y \leq 12, x - y \geq 0 \; and \; 0 \leq x \leq 20.$ Solve using Graphical method.	**3**
2B.	Derive the expression for mean and variance of an exponential distribution	**3**
2C.	In a test on 2000 bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for (i) More than 2150 hours (ii) less than 1950 hours (iii) more than 1920 hours and but less than 2160 hours	**4**
3A.	Box I contains 4 black and 5 green balls. Box II contains 5 black and 4 green balls. Three balls are drawn at random from Box I and transferred to box II. Then a ball is drawn from box II. What is the probability that it is green? If it is green then what is the probability that 2 green and 1 black ball is transferred from box I to box II.	**3**

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3B. Given pdf $f(x) = \begin{cases} ax; & 0 < x < 1 \\ a; & 1 < x < 2 \\ -ax + 3a; & 2 < x < 3 \\ 0 & elsewhere \end{cases}$. Determine 'a' and find cumulative distribution function.
3

3C. Compute u for three time steps. Given $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ $, 0 \le x \le 1, t \ge 0.$ $u(x,0) = 1 - x^2, \frac{\partial u(x,0)}{\partial t} = 0, u(0,t) = 1 - t^2, u(1,t) = 0.$ Choose $h = 0.25.$
4

4A. If A and B are independent then prove that

(i) $\bar{A}$ and B are independent. (ii) $\bar{A}$ and $\bar{B}$ are independent.
3

4B. Fit a straight line for the following data

x	50	70	100	120
y	12	15	21	25

3

4C. Solve the following LPP by simplex method.

Max $Z = 4x_1 + 3x_2 + 6x_3$ subject to

$$2x_1 + 3x_2 + 2x_3 \le 44$$

$$4x_1 + 3x_3 \le 470$$

$$2x_1 + 5x_2 \le 430, \quad x_1, x_2, x_3 \ge 0$$

4

5A. Solve for four time steps. $32\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $0 \le x \le 1, t > 0.$ Given that $u(x,0) = 0, u(0,t) = 0, u(1,t) = t.$ Assume that $h = 0.25$ and $\lambda = 0.5.$
3

5B. Find the Z transform of $\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$
3

5C Use Charne's penalty method to

Maximize $Z = 3x_1 + 2x_2$

subject to the constraints $2x_1 + x_2 \le 2, 3x_1 + 4x_2 \ge 12, x_1, x_2 \ge 0$
4