

### MANIPAL INSTITUTE OF TECHNOLOGY IV SEMESTER B.TECH. Print and Media Technology

## **END SEMESTER MAKEUP EXAMINATIONS, June 2018**

## SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2212]

#### REVISED CREDIT SYSTEM (12/06/2018)

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

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

1A.	Solve by simplex method; Max $z = x_1 + 3x_2$ Subject to $x_1 + 2x_2 \le 10$ $x_1 \le 5$ $x_2 \le 4$ $x_1, x_2 \ge 0.$	4
1B.	Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1$ , $t > 0$ . Given $u(x, 0) = 100(x - x^2)$ , $u(0, t) = u(1, t) = 0$ . Take $h = \frac{1}{4}$ , $\lambda = \frac{1}{3}$ and compute u for four time steps.	3
1C.	If $X_1$ , $X_2$ and $X_3$ are uncorrelated random variables having same standard deviation, find correlation coefficient between $U = X_1 + X_2$ and $V = X_2 + X_3$ .	3
2A.	Find correlation coefficient between X and Y, if $(X, Y)$ is a 2-dimensional random variable with $f(x, y) = \begin{cases} 2 - x - y; & 0 < x < 1, & 0 < y < 1 \\ 0; & Otherwise \end{cases}$	4
2B.	The coefficient <i>a</i> , <i>b</i> and <i>c</i> of the quadratic equation $ax^2 + bx + c = 0$ are determined by throwing a dice 3 times. Find the probability that the roots are real.	3
2C.	Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 10)$ , over the region $0 < x < 3$ , $0 < y < 3$ with h = 1. Given u(x, 3) = u(3, y) = u(0, y) = u(x, 0) = 0.	3



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	Suppose X is a one dimensional random variable with p.d.f. given by	
3A.	$f(x) = \begin{cases} ax; & 0 < x < 1\\ a; & 1 < x < 2\\ -ax + 3a; & 2 < x < 3\\ 0; & Otherwise \end{cases}$ Find (i) a such that $f(x)$ is a valid p.d.f.	4
	(11) expression for cumulative distribution function	
3B.	Solve by finite difference method $xy'' + y = 0, h = 0.25, y(1) = 1 \& y'(2) = 2.$	3
3C.	Find mean and variance of Binomial distribution.	3
4A.	A 2-dimensional random variable $(X, Y)$ has joint p.d.f. $f(x, y) = \begin{cases} x^2 + \frac{xy}{3}; & 0 \le x \le 1, \ 0 \le y \le 2\\ 0; & Otherwise \end{cases}$ Find (i) $\Pr\left(y < \frac{1}{2} \mid x < \frac{1}{2}\right)$ and (ii) Check whether they are independent?	4
4B.	Solve by Graphical method; Max $z = 3x_1 + 2x_2$ Subject to $5x_1 + x_2 \ge 10$ $x_1 + x_2 \ge 6$ $x_1 + 4x_2 \ge 12$ $x_1, x_2 \ge 0.$	3
4C.	In a Poisson distribution if $Pr(x = 2) = \frac{2}{3}Pr(x = 1)$ . Find $Pr(x = 0)$ and $Pr(x \ge 3)$ .	3
5A.	In an exam, the pass percentage is 45% and distinction percentage is 9%. The minimum marks and distinction marks are 40 and 74 respectively. Assuming marks are normally distributed, obtain mean and variance of the distribution.	4
5B.	The probability that a student passes an examination is 0.8 given that he has studied. The probability that he passes an examination given that he has not studied is 0.2. Assume that probability of the student passing the exam is 0.6. Given that the student passes the exam. What is the probability that he has studied?	3
5C.	Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1$ , $t > 0$ . Choosing h=0.25, and given that $u(x, 0) = \frac{\partial u}{\partial t}(x, 0) = 0$ and $u(0, t) = u(1, t) = 100 \sin \pi t$ . Compute u for 4 time steps.	3

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