Reg. No.

 MANIPAL INSTITUTE OF TECHNOLOGY

 MANIPAL

 (A constituent unit of MAHE, Manipal)

# IV SEMESTER B.TECH. Print and Media Technology

### END SEMESTER EXAMINATIONS, APRIL 2018

#### SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2212] REVISED CREDIT SYSTEM (17/04/2018)

#### Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

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

1A.	Find correlation coefficient between X and Y, if $(X, Y)$ is a 2 dimensional random variable with $f(x, y) = \begin{cases} x + y; & 0 < x < 1, & 0 < y < 1 \\ 0; & Otherwise \end{cases}$ .	4
1B.	Solve $32\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1, t > 0$ . Given $u(x, 0) = u(0, t) = 0$ and $u(1, t) = t$ . Take $h = \frac{1}{4}$ , $\lambda = \frac{1}{6}$ and compute u for four time steps.	3
1C.	A bag contains 40 tickets numbered 1,2,,40 of which four are drawn at random and arranged in ascending order $(t_1 < t_2 < t_3 < t_4)$ . Find the probability of $t_3$ being 25.	3
2A.	Solve by simplex method; Max $z = 2x_1 + 4x_2 + 3x_3$ Subject to $3x_1 + 4x_2 + 2x_3 \le 60$ $2x_1 + x_2 + 2x_3 \le 40$ $x_1 + 3x_2 + 2x_3 \le 80$ $x_1, x_2, x_3 \ge 0.$	4
2B.	If $X_1$ , $X_2$ and $X_3$ are uncorrelated random variables with $\sigma = 5$ , 12 and 9 respectively. Find correlation coefficient between $U = X_1 + X_2$ and $V = X_2 + X_3$ .	3
2C.	Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -81xy$ , over the region $0 < x < 1$ , $0 < y < 1$ with $h = \frac{1}{3}$ Given $u(x, 1) = u(1, y) = 100$ and $u(0, y) = u(x, 0) = 0$ .	3

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	Suppose <i>X</i> is a one dimensional random variable with p.d.f. given by	
3A.	$f(x) = \begin{cases} x; & 0 < x < 1\\ 2 - x; & 1 < x < 2.\\ 0; & x > 2 \end{cases}$ Find (i) expression for cumulative distribution function (ii) $Pr(0.8 < x < 1.8)$ (iii) mean.	4
3B.	Solve by finite difference method $y'' + xy = 1$ , $h = 0.5$ , $y(0) = 0 \& y'(1) = 1$ .	3
3C.	Find mean and variance of Exponential distribution.	3
4A.	In a normal distribution 7% of the items are below 35 and 89% of the items are below 63. Find the mean and standard deviation of the distribution.	4
4B.	Solve by Graphical method; Max $z = 10x_1 + 15x_2$ Subject to $2x_1 + x_2 \le 26$ $2x_1 + 4x_2 \le 56$ $-x_1 + x_2 \le 5$ $x_1, x_2 \ge 0.$	3
4C.	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 $u(x, 0) = 100(x - x^2)$ , $u(0, t) = u(1, t) = 0$ and $\frac{\partial u}{\partial t}(x, 0) = 0$ , compute u for 4 time steps.	3
5A.	A 2-dimensional random variable $(X, Y)$ has joint p.d.f. $6e^{-2x-3y}$ , $x, y \ge 0$ . Find (i) Pr(1 < x < 2, 2 < y < 3) and (ii) Check whether they are independent?	4
5B.	An office has 4 secretaries handling 20%, $60\%$ , $15\%$ and $5\%$ of the files of government report respectively. The probability that they misfile such reports are 0.05, 0.1, 0.1, 0.05 respectively. Find the probability that a misfiled report can be blamed on the first secretary.	3
5C.	In a factory producing machines there is a small chance of $1/_{500}$ for any machine to be defective. The machines are supplied in packets of 10. Calculate approximate number of packets containing (i) no defective (ii) 1 defective (iii) 2 defective machines in a lot of 20,000 such packets.	3