Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

## IV SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER MAKE UP EXAMINATIONS, JUNE 2017

## SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2205]

## REVISED CREDIT SYSTEM (19/06/2017)

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

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

1A.	Solve the following Linear Programming Problem by the graphical						
	method: Maximize $z = 5x + 4y$ subject to						
	$6x + 4y \le 24; x + 2y \le 6; -x + y \le 1; y \le 2; x, y \ge 0.$						4M
1B.	Solve by the method of finite differences, y'' = x + y with $y(0) = y(1) = 0$ and $h=0.25$ .						3М
1C.	Suppose that the life lengths of two electronic devices, say $D_1$ and $D_2$ , have distributions N(40,36) and N(45,9), respectively. If the electronic device is to be used for 42 hour period, which device is to be preferred?						3M
2A.	Using Simplex method solve; Maximize $Z = 5x_1 + 3x_2$						
	Subject to, $x_1 + x_2 \leq 2$ ,						
	$5x_1 + 2x_2 \le 10$ ,						
	$3x_1 + 8x_2 \le 12$ ,						
	$\mathbf{x}_1, \mathbf{x}_2 \ge 0.$						4111
2B.	An electronic device has a life length T which is exponentially distributed with parameter $\alpha = 0.001$ . Suppose that 100 such devices are tested, yielding observed values $T_1, \dots, T_{100}$ . What is the probability						
	that $950 < I < 1100?$						
2C.	By the method of least squares, find the straight line $y = ax + b$ that fits						
	best for the following data:						
	<i>x</i>	1	2	3	4	5	017
	У	14	27	40	55	68	3M

3A.	Distributor of bean seeds determines from extensive test that 5% of large batches of seeds will not germinate. He sells seeds in packets of 50 and guarantees 92% germination. Determine the probability that particular packet violates the guaranty.				
3B.	Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1$ , $t > 0$ , $u(x,0) = 100 \sin \pi x$ , u(0, t) = u(1, t) = 0. Compute $u$ for three time steps with $h = 0.2$ . Use Schmidt's method.				
3C.	Find the moment generating function of uniform distribution over (-a, a). Hence find its mean.				
4A.	With step size $h = \frac{1}{2}$ , Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -1$ , $ x  < 1$ , $ y  < 1$ , $u(\pm 1, y) = u(x, \pm 1) = 0$ .				
4B.	Suppose that X has pdf $f(x) = 2x$ in [0, 1]. Find the pdf of $Y = 3X+1$ .				
4C.	Show that the geodesics on a plane are straight lines.				
5A.	Solve $\frac{\partial^2 u}{\partial t^2} = 16 \frac{\partial^2 u}{\partial x^2}$ with $(x, 0) = x^2(5-x)$ , $\frac{\partial u}{\partial t}(x, 0) = 0$ ; $u(0, t) = u(5, t) = 0$ , taking $h = 1$ up to $t = 1.25$ .				
5B.	Obtain mean and variance of Gamma distribution.				
5C.	State Euler's equation. On which curve the functional $\int_{0}^{\pi/2} \left[ (y')^2 - y^2 + 2xy \right] dx$ with $y(0) = 0$ and $y(\pi/2) = 0$ be extremized?	3М			

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