Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (BIOMEDICAL ENGINEERING) END SEMESTER MAKE-UP EXAMINATIONS, JUNE 2018 SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2203] REVISED CREDIT SYSTEM

(19-06-2018)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

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

1A.	A class brown brown	s contai eyes. F eyes.	ins 10 be Find the	oys and probabi	30 girls lity that	of whic the per	ch half th son sele	ne boys a cted at r	and half the girls have andom is a boy or has	3M
1 B .	A can They	hit a ta fire toge	rget 3 ti ether. W	mes in 5 That is th	5 shots. le proba	B 2 time bility th	es in 5 s at shots	hots and hit?	1 C 3 times in 4 shots.	3M
1C.	It is suspected that a patient has one of the diseases A_1 , A_2 , A_3 . Suppose that the population percentages suffering from these illnesses are in the ratio 2:1:1. The patient is given a test which turns out to be positive in 25% of the cases of A_1 , 50% of A_2 , and 90% of A_3 . Given that out of three tests taken by the patient two were positive, find the probability for the illnesses A_3 .							4M		
2A.	Diame $pdf f($	eter of a $ \begin{aligned} (x) &= \begin{cases} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	in electri kx(1 - 0) Obtain Obtain Determ	$\begin{array}{c} \text{(cal cabl)} \\ x) & 0 \\ el \\ \text{(the valu)} \\ \text{(ts cdf)} \\ \text{(ine 'b' s)} \end{array}$	e is assu $\leq x \leq$ sewher e of k such that	timed to 1 e t $P(X < $	be a correct be $a = 2$	P(X > C)	random variable with	3M
2B.	A coin E(X) a	n is toss and V(X	sed till f K).	irst head	d appea	rs. Let 2	X denot	es the n	umber of tosses. Find	3M
2C.	Support $f(x, y)$	$f(x) = \begin{cases} 2, \\ 0, \end{cases}$	o dimen 0 < x el	sional ra < y < sewher	andom v 1 .e. Find	ariable/ margina	(X, Y) l al and co	has joint ondition	pdf al pdfs of X and Y.	4 M
3A.	Let X, Y, Z be uncorrelated random variables with standard deviation 5, 12 and 9 respectively. If $U = X + Y$ and $W = Y + Z$ find the correlation coefficient between U and W.							3M		
3B.	Using the method of least squares, fit a straight line of the form $y = a + bx$ to the									
	following data.									
		X	1.0	1.2	1.4	1.6	1.8	2.0		
		У	0.45	0.55	0.00	0.70	0.80	0.85		

Reg. No.										
----------	--	--	--	--	--	--	--	--	--	--

MANIPAL INSTITUTE OF TECHNOLOG

MANIPAL (A constituent unit of MAHE, Manipal)

3C.	Prove that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$ and $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. Hence deduce that $J_{-\frac{1}{2}}(x) + J_{\frac{1}{2}}(x) = \frac{2}{\pi x}$	4 M							
4A.	Prove that $P_n(x) = \frac{1}{n! 2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$.								
4B.	Prove that $J_0^2 + 2J_1^2 + 2J_2^2 + 2J_3^2 + 2J_4^2 + \dots = 1$								
4C.	Use Big M method to solve Maximize $P = 3x + 2y + 3z$ Subject to $2x + y + z \le 2$ $3x + 4y + 2z \ge 8$ $x, y, z \ge 0$	4M							
5A.	Use simplex method to solve Maximize $Z = 3x + 5y$ Subject to $3x + 2y \le 18$ $x \le 4$ $y \le 6$ $x, y \ge 0$	3M							
5B.	Find mean and variance of binomial distribution								
5C.	Steel rods are manufactured to be 3 inches in diameter but they are acceptable if they are inside the limits 2.99 inches and 3.01 inches. It is observed that 5% are rejected as oversize and 5% are rejected as undersize. Assuming that the diameters are normally distributed, find mean and standard deviation of the distribution. Hence calculate the population of rejects if permissible limits were widened between 2.985 inches and 3.015 inches.								