



# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



# III SEMESTER B.TECH (CSE/ I&CT/CC)

## END SEMESTER MAKE-UP EXAMINATION, JUNE/JULY 2016

# SUBJECT: ENGINEERING MATHEMATICS IV [MAT-2206]

### **REVISED CREDIT SYSTEM**

#### Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

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

1A.	Box 1 contains 4 black and 5 green balls and box 2 contains 5 black and 4 green balls. 3 balls are randomly drawn from box 1 without replacement and transferred to box 2 and then a ball is drawn from box 2 and is found to be green. What is the probability that 2 green and 1 black ball are transferred from box 1?	4
1B.	Suppose that X has a distribution $N(3, 4)$ find c such that $P(X > c) = 2P(X \le c)$ .	3
1C.	Let $\overline{X}$ and $S^2$ be the mean and the variance of a random sample of size 25 from a normal distribution N(3,100). Then evaluate P( $0 < \overline{X} < 6, 55.2 < S^2 < 145.6$ ).	3
2A.	Suppose that $X \sim N(\mu, 4)$ . A sample of size 25 is the sample mean $\overline{x} = 78.3$ . Obtain 99% confidence interval for the mean value $\mu$ .	4
2B.	Let $x_1, x_2,, x_n$ are random samples from x of size n. Its pdf is $f(x;\theta) = \begin{bmatrix} \frac{\theta^x e^{-\theta}}{x!} ; x = 0, 1,, 0 < \theta < \infty \\ 0 ; elsewhere \\ \theta. \end{bmatrix}$ Find maximum likelihood estimator for	3
2C.	A six sided die is suspected of being biased, with probabilities $\frac{1}{12}$ for each of faces 1 and 2; $\frac{1}{6}$ for 3 and 4 each; and $\frac{1}{4}$ for 5 and 6 each. To test this, it is rolled 120 times and the number of appearances of the six faces 1,,6 are 10, 15, 27, 17, 28, and 23 respectively. Does this data confirm the suspicion at 0.01 level of significance?	3

	Reg.	No.											
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3A.	If $X \sim N(0, \sigma^2)$ and $Y \sim N(0, \sigma^2)$ $R = \sqrt{X^2 + Y^2}$ .	where	X an	d Ya	are i	indep	ende	ent, f	ind t	he p	odf o	f <b>4</b>	
<b>3B.</b>	The co-efficients a, b, c of the equation $ax^2+bx+c=0$ are determined by throwing a three times. Find the probability that the roots are real.										a die	e 3	
3C.	Suppose that the joint pdf of (X, Y) is given by $f(x, y) = \begin{cases} e^{-y}; x > 0, y > x \\ 0; elsewhere \end{cases}$ Find the marginal pdf of X and Y.											3	
<b>4A.</b>	Using Central limit theorem compute an approximate probability that the mean of a random sample of size 15 from a distribution having pdf $f(x) = \begin{cases} 3x^2, & 0 \le x \le 1 \\ 0, & \text{elsewhere} \end{cases}$ is between 3/5 and 4/5.										1 <sup>5</sup> 4		
4B.	Find the mgf of the random variable $v$ (- a, a). Hence evaluate E (X <sup>2n</sup> ).	which is	unifc	ormly	y dis	stribu	ited	in th	e int	erval	[	3	
4C.	Two independent observations $X_1$ and $X_2$ are made on a random variable $X$ with density function $f(x;\theta) = \theta e^{-\theta x}$ , $x > 0$ , where $\theta > 0$ . To test $H_0: \theta = 0.5$ against $H_1: \theta = 0.25$ , it is decided to reject $H_0$ if $x_1 + x_2 \ge 9.5$ and accept otherwise. Obtain the significance level and power of the test.										n 5 <b>3</b>		
5A.	Assume that the average lifespan of hours with standard deviation 60 how whose lifespan is (a) More than less than 2160 hours. (c) From a span $X$ is normally distributed.	comput ours. Fin 2150 h pool of	ers j nd tl iours 200	produ ne e 00 cu	uced xpec (b) ompo	by eted Mo uters	the num ore th , ass	com ber han 1 umin	pany of c 920 Ig tha	is omp hour at th	2040 uters rs and e life	) , 1 4	
5B.	3 balls are randomly selected from a The person who selects the ball wins for each red ball selected. Let X be probability mass function of X.	urn con \$1 for the tota	tainin each 1 wii	ig 3 whi ining	whit te b s fro	e, 3 all is om th	red, sele ne ex	and ected perin	5 bl and ment.	lack lose Fin	balls es \$1 d the	3	
5C.	. Let X be a continuous random $Y = 2X + 1$ . Obtain the equivalent calculate its probability.	variabl event	e w of	ith p $\{Y \ge$	odf 5} in	f(x) ter	$e^{-1}$	x, x of	>0. X ar	Sup nd h	opose	e , 3	