Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (CS/IT/CC) END SEMESTER EXAMINATIONS, April 2018

SUBJECT: ENGINEERING MATHEMATICS - IV

[MAT -2206]

REVISED CREDIT SYSTEM
(23/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- All questions carry equal marks.

1A.	Box 1 contains 5 red and 4 green balls and box 2 contains 4 red and 6 green balls. Three balls are randomly drawn from box 1 and placed in box 2. Then a ball is taken from box 2. If the ball taken from box 2 is found red, find the probability that 2 red and 1 green balls are transferred from box 1 to box 2?	**4**
1B.	Two coins C_1 and C_2 have a probability of falling heads p_1 and p_2, respectively. You win a bet if in 3 tosses you get at least two heads in succession. You toss the coins alternately starting with either coin. If $p_1 > p_2$, what coin would you select to start the game?	**3**
1C.	The diameter of an electric cable X is assumed to be a continuous random variable with p.d.f $f(x) = 6x(1-x),\ 0 \le x \le 1$. a) Find the c.d.f of X. b) Determine a number ‘b’ such that $P(x<b) = 2P(x>b)$	**3**
2A.	The following figures show that the distribution of digits in number chosen at random from a telephone directory. Test whether the digits occur equally frequently at 0.05 significance level.	**4**

Digit	0	1	2	3	4	5	6	7	8	9	total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10000

2B.	The random variable (X, Y) has joint pdf given by $f(x,y)=\begin{cases} x+y, & 0\le x\le 1,\ 0\le y\le 1 \\ 0, & \text{elsewhere}\end{cases}$. Compute the correlation coefficient between X & Y.	**3**
2C.	The annual rainfall at a certain locality is known to be a normally distributed random variable with mean value equal to 29.2 inches and standard deviation 2.5 inches. How many inches of rain (annually) is exceeded about 5 percent of the time?	**3**
3A.	Let (X_1, X_2) be a sample of size 2 from the distribution having the pdf $f(x;\theta)=\begin{cases}\frac{1}{\theta}e^{\frac{-x}{\theta}} & 0<x<\infty,\ \theta>0 \\ 0 & Elsewhere\end{cases}$. We reject H_0: θ =2 and accept H_1: θ =1, if the observed values (x_1, x_2) are such that $\frac{f(x_1;2)f(x_2;2)}{f(x_1;1)f(x_2;1)}\le \frac{1}{2}$. Find significance level of the test and the power of the test when H_0 is false.	**4**
3B.	Show that for the random variable X having normal distribution with mean μ and variance σ^2, $E(X-\mu)^{2n}=1.3.5.....(2n-1)\sigma^{2n}$.	**3**
3C.	Suppose that random variable X is uniformly distributed over (-1, 1). Find the pdf of $Y=4-x^2$.	**3**
4A.	Let (X_1, X_2, …, X_n) denote a random sample from a distribution which is $N(\theta_1.\theta_2), -\infty<\theta_1<\infty, -\infty<\theta_2<\infty$. Find maximum likelihood estimators for θ_1 & θ_2.	**4**
4B.	Find the mean and variance of Gamma distribution.	**3**
4C.	Suppose that X has distribution N(μ, σ^2). A sample of size 20 yields $\bar{x}$ = 3.8 and s^2 = 4.6. Obtain a 90 percent confidence interval for σ^2 and μ.	**3**
5A.	Compute an approximate probability that the mean of a random sample of size 8, from a distribution having the pdf $f(x)=\begin{cases}2(1-x) & 0<x<1 \\ 0 & elsewhere\end{cases}$ is between $\frac{1}{2}$ and $\frac{5}{8}$.	**4**
5B.	Suppose that X is uniformly distributed over (– a, a) where a > 0. Whenever possible determine 'a' such that (i) $\Pr(X>1)=1/3$ (ii) $\Pr(X<1)=1/2$ (iii) $\Pr(\lvert X\rvert<1)=\Pr(\lvert X\rvert>1)$	**3**
5C.	Find the moment generating function of binomial distribution with parameters n and p and hence find its mean and variance.	**3**