Reg.					
No.					



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (MECHANICAL) MAKE UP EXAMINATIONS, JUNE 2018

SUBJECT: ENGINEERING MATHEMATICS - IV

[MAT -2210]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL questions.

✤ All questions carry equal marks.

1A.	Obtain the series solution of the Legendre's equation						
	$(1 - x^2)y'' - 2xy' + n(n+1)y = 0$ in the form $y = y_1 + y_2$						
1B.	If X is a continuous random variable with p.d.f. given by						
	$kx, \qquad 0 \le x < 2$						
	$f(x) = \int 2k, \qquad 2 \le x < 4$						
	$\int (x)^{-1} \left\{ -kx + 6k, 4 \le x < 6 \right\}$	3					
	0, Elsewhere						
	a)Find the constant k b) Find the c.d.f. of X c) Find P ($2 < X < 3$).						
1C.	A and B throw alternatively with a pair of dice. A wins if he throws the sum 6 before B throws the sum 7 and B wins if he throws 7 before A throws 6. If A begins, find his chance of winning.						
2A.	Prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = \begin{cases} 0 & \alpha \neq \beta \\ \frac{[J_{n+1}(\alpha)]^2}{2} & \alpha = \beta \end{cases}$						
2B.	Three machines X, Y, Z with capacities proportional to 2:3:4 are producing bullets. The probabilities that the machines X, Y, Z produce defective bullets are 0.1, 0.2, 0.1 respectively. A bullet is taken from a day's production and is found to be defective. What is the probability that it came from company X?						
2C.	After correcting 50 pages of the proof of a book, the proof reader finds that there are, on the average, 2 errors per 5 pages. How many pages would one expect to find with 0,1,2,3 and 4 errors, in 1,000 pages of the first print of the book?						

3A.	Let \overline{X} be the mean of random sample of size 6 from a normal distribution N (0, 125). Find C, so that P{ $\overline{X} < C$ }= 0.9. Also, find P{ 33.542 < S^2 < 55.625}.							
3B.	Prove that (i) $J_{n-1}(x) + J_{n+1}(x) = \frac{2n}{x}J_n(x)$ (ii) $J_{n-1}(x) - J_{n+1}(x) = 2J'_n(x)$							
3C.	In a normal distribution, 34% of the items are under 52 and 9% are over 60. Find the mean and variance of the distribution.							
4A.	Fit a curve of the type $y = ae$	e ^{bx} for th	ne data:					
	x 0	2	4	6	8]		
	y 150	63	28	12	56	-	4	
						1		
4B.	Show that $(1 - 2xt + t^2)^{-\frac{1}{2}} = \sum_{n=0}^{\infty} t^n P_n(x)$							
4C.	A lot consists of 4 defective and 8 non defective balls. Balls are selected one after the other at random (without replacement) and are tested till all the defective balls are detected. What is the probability that the last defective ball is detected at the 5 th test?							
5A.	Suppose that X and Y are independent. X takes the values 2, 5, 7 with probability $1/2$, $1/4$, $1/4$ respectively. Y takes the values 3 and 5 with probabilities $1/3$ and $2/3$ respectively. Determine the probability distribution of $Z = X+Y$. Hence, find mean of Z.							
5B.	If X, Y and Z are uncorrelated random variables with standard deviation 5, 12 and 9 respectively, then find the correlation co-efficient between $U = X+Y$ and $V = Y+Z$.						3	
5C.	Suppose that X has the following pdf $f(x) = \lambda e^{-\lambda(x-a)}$, $x \ge a$, then find the moment generating function of X and hence find E(X) and V(X).						3	