Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
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IV SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER REGULAR EXAMINATIONS, APRIL 2018

SUBJECT: ENGINEERING MATHEMATICS-IV [MAT 2201]

REVISED CREDIT SYSTEM
(19-04-18)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	A fair coin is tossed 3 times. Let X : 0 or 1 according as head or tail occurs on the first toss. Let Y be the number of heads. Find the joint distribution for the above distribution. Also find correlation coefficient between X and Y.	**4**
1B.	State Bayes theorem. In an exam each candidate is admitted or rejected according whether he has passed or failed the test. Of the students who are really capable, 80% pass the test and of the incapable students, 25% pass the test. Given that 40% of the candidates are really capable. Find the proportion of capable college students.	**3**
1C.	Find constant k so that $f(x)$ is a valid pdf. Hence obtain the expression for cumulative distribution function for the random variable with pdf $f(x) = \begin{cases} Kx(1-x) & 0 < x < 1 \\ 0 & \text{Elsewhere} \end{cases}$	**3**
2A.	If A and B are independent then show that i) A and $\bar{B}$ are independent ii) $\bar{A}$ and $\bar{B}$ are independent.	**4**
2B.	If X, Y, Z are uncorrelated random variables with standard deviation $5, 12$ and 19 respectively and if $U = X + Y$ and $V = Y + Z$, Evaluate the correlation coefficient between U and V.	**3**
2C.	A life insurance salesman sells on the average 3 life insurance policies per week. Use Poisson's law to calculate the probability that in a given week he will sell i) Some policies ii) 2 or more policies but less than 5 policies. iii) Assuming that there are 5 working days per week, what is the probability that in a given day he will sell one policy?	**3**

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3A.	The time X minutes, taken by a person to install a satellite dish may be assumed to be a normal random variable with $P(X < 170) = 0.14$ and $P(X > 200) = 0.03$. Find the mean and standard deviation of X.	**4**
3B.	Find the variance of Gamma distribution	**3**
3C.	If $M_X(t)$ is the mgf of a random variable X. Then show that mgf of $Y = aX + b$ where and b are constants is $M_y(t) = e^{bt}M_X(at)$. If $M_X(t) = (0.3e^t + 0.7)^8$, find the mgf of $Y = 5X + 3$. Hence find $E(Y)$.	**3**
4A.	Let X be a Continuous random variable with pdf $f(x) = \begin{cases} 1; & 0 < x < 1 \\ 0\,; \text{elsewhere} \end{cases}$. Let X_1 and X_2 be a random sample from X. Let $Y_1 = X_1 + X_2, Y_2 = X_1 - X_2$. Find the pdf of Y_2.	**4**
4B.	Express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$	**3**
4C.	Compute an approximate probability that mean of a random sample of size 15 from a distribution having pdf $f(x) = \begin{cases} 2x\,; 0 < x < 1 \\ 0; \text{elsewhere} \end{cases}$ is between $\frac{3}{5}$ & $\frac{4}{5}$.	**3**
5A.	Find the missing values in the following distribution, given that the mean and the median are 62.7 and 66 respectively.	**4**

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	1	3	-	8	-	30	38

5B.	For the following data given below, find the equation to the best fitting curve of the form $y = ab^x$				**3**

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

5C.	Solve the following equation in series $(1 - x^2)y'' + 2y = 0$, Given $y(0) = 4, y'(0) = 5$.	**3**

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