Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
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IV SEMESTER B.TECH (INDUSTRIAL & PRODUCTION ENGINEERING)
MAKEUP EXAMINATIONS, JUNE 2017

SUBJECT: ENGINEERING MATHEMATICS IV (MAT 2209)
REVISED CREDIT SYSTEM

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates

❖ Answer **ALL** the questions. All questions carry equal marks

1A.	Find the missing values in the following distribution, given that the mean and the median are 62.7 and 66 respectively.	3

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

1B.	A five digit number is formed by the digits 0, 1, 2, 3, 4. Find the probability that the number is divisible by 4.	3

1C.	Find the regression lines of y on x and x on y for the following data.	4

X	104	110	112	114	120
Y	106	116	140	175	173

2A.	If X_1, X_2, X_3 are uncorrelated random variables having same standard deviation, find the correlation coefficient between $X_1 + X_2$ and $X_2 + X_3$.	3

2B.	The p. d. f. of a random variable is given by $f(x) = \begin{cases} kx(1-x)e^x, & 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases}$ Find k and evaluate mean and variance.	3

2C.	Suppose that the joint pdf of (X,Y) is given by $f(x, y) = \begin{cases} 8xy & 0 < x < y < 1 \\ 0 & \text{elsewhere} \end{cases}$ Find marginal distribution of X and Y.	4

3A.	In a bolt factory there are four machines A, B, C, D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3% & 2 % are defective. If a bolt drawn at random was found to be defective, what is the probability that it was manufactured by D?	3

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3B.	The average number of defects per wafer (defect density) is 3. The redundancy built into the design allows for up to 4 defects per wafer. What is the probability that the redundancy will not be sufficient if the defects follow a Poisson distribution?	**3**
3C.	Two independent random variables X and Y having pdf $f(x) = e^{-x}, g(y) = 2e^{-2y}, 0 \leq x, y \leq \infty$. Find the pdf of $(X + Y)$.	**4**
4A.	Find the mean and variance of Exponential distribution.	**3**
4B.	Let s^2 be the variance of the random sample of size 6. If $N(u, 12)$, then find $P(1.8 < S^2 < 27)$.	**3**
4C.	In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation.	**4**
5A.	Compute the mean deviation from the mean for the following data. <table><tr><td>Age(years)</td><td>18-22</td><td>22-26</td><td>26-30</td><td>30-34</td><td>34-38</td></tr><tr><td>women</td><td>20</td><td>30</td><td>11</td><td>3</td><td>1</td></tr></table>	**3**
5B.	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 $M_X(t) = (0.4e^t + 0.6)^8$, find the mgf of $Y = 3X + 2$. Hence find $E(Y)$.	**3**
5C.	Compute an approximate probability that mean of a random sample of size 15 from a distribution having pdf $f(x) = \begin{cases} 3x^2, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$ is between $\frac{3}{5}$ & $\frac{4}{5}$.	**4**