Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (ELECTRONICS AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE/JULY 2016

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2207]

REVISED CREDIT SYSTEM (MAKEUP)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates: Answer all the questions. .

1A.	Solve the difference equation using Z- transform $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$, $y_0 = y_1 = 0$.	**3**
1B.	Solve $y'' + (1 + x)y' - y = 0,\ y(0) = y'(0),\ y(1) + y'(1) = 1$ with h= 0.5.	**3**
1C.	Three plants C_1, C_2 and C_3 produce respectively 10, 50 and 40 percent of a company's output. Although plant C_1 is a small plant, its manager believes in high quality and only 1% of its products are defective. The other two, *viz*., C_2 and C_3 are worse and produce items that are 3% and 4% defective respectively. All products are sent to a central warehouse. One item is selected at random. Find the probability that it is defective. Also, determine the probability that the selected defective item is the one manufacture by plant C_1.	**4**
2A.	Solve the difference equation $y_{n+2} + y_{n+1} + y_n = n^2 + n + 1$.	**3**
2B.	Suppose that the joint p.d.f of two dimensional random variable (X, Y) is given by $f(x, y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 < x < 1, \quad 0 < y < 2 \\ 0, & \text{elsewhere} \end{cases}$ Compute (a) Marginal pdfs of X and Y (b) $P(X + Y < 1)$ (c) $P(Y < X)$.	**3**
2C.	Solve the Poisson equation $u_{xx} + u_{yy} = -81xy,\ 0 < x < 1, 0 < y < 1,$ given that	**4**

<table>
<tr><td></td><td>u(0,y) = 0, u(x,0) = 0, u(1,y) = 100, u(x,1) =100 and h=1/3.</td><td></td></tr>
<tr><td>3A.</td><td>A random variable X has the following probability function.
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>P(x)</td><td>0</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>k^2</td><td>$2\ k^2$</td><td>$7\ k^2+k$</td></tr>
</table>
Find i) k ii) $P[X \geq 6]$ iii) $P[0 < X < 5]$ iv) If $P[X \leq x] > 1/2$, find the minimum value of x.</td><td>3</td></tr>
<tr><td>3B.</td><td>A five digit number is formed using the digits 0, 1, 2, 3, 4 without repetition. Find the probability that the number formed is divisible by 4.</td><td>3</td></tr>
<tr><td>3C.</td><td>Fit a $Y= a+bX+cX^2$ for the following data
<table>
<tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>6</td><td>8</td></tr>
<tr><td>Y</td><td>2.4</td><td>3</td><td>3.6</td><td>4</td><td>5</td><td>6</td></tr>
</table></td><td>4</td></tr>
<tr><td>4A.</td><td>If X, Y, and Z are uncorrelated random variables with standard deviations 5, 12, and 9 respectively and if U=X+Y and V=Y+Z, evaluate the correlation coefficient between U and V.</td><td>3</td></tr>
<tr><td>4B.</td><td>In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and the standard deviation.</td><td>3</td></tr>
<tr><td>4C.</td><td>The number of telephone lines busy at an instant of time is a binomial variate with probability 0.2. If at an instant of 10 lines are chosen at random, what is the probability that i) 5 lines are busy? ii) at most 2 lines are busy?</td><td>4</td></tr>
<tr><td>5A.</td><td>i)If $M_{X_1}(t) = (1-2t)^{-3}$, $M_{X_2}(t) = (1-2t)^{-2}$ and $M_{X_3}(t) = (1-2t)^{-1/2}$ then find the mgf of $Z = X_1+X_2+X_3$ (where X_1, X_2 and X_3 are independent). Hence obtain the pdf of Z.
ii) Obtain mgf of Gamma distribution.</td><td>3</td></tr>
<tr><td>5B.</td><td>If $\bar{X}$ is the mean of a random sample size n from a normal distribution with mean μ and variance 100, find n so that $P\{\mu - 5 < \bar{X} < \mu + 5\}$=0.954.</td><td>3</td></tr>
<tr><td>5C.</td><td>Two independent random variables X and Y is normally distributed with $\mu = 0$ and σ^2 , then find pdf of $R= \sqrt{X^2 + Y^2}$.</td><td>4</td></tr>
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