Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH ICE/ EEE ENGINEERING END SEMESTER (MAKE-UP) EXAMINATION, June 2018

SUBJECT: ENGINEERING MATHEMATICS-IV (MAT-2208)

Time: 3 Hours Max. Marks : 50

1A. Solve $\dfrac{\partial^2 u}{\partial^2 t} = \dfrac{\partial^2 u}{\partial x^2}$ under the given conditions $u(x,0) = 100\sin(\pi x), u(0,t) = u(1,t) = 0$, $\dfrac{\partial u}{\partial t}(x,0) = 0$. Taking $h = \dfrac{1}{4}$, compute u for four time steps.

1B. With step size $h = 0.5$, solve $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = -1, |x| < 1, |y| < 1, u(\pm 1, y) = u(x, \pm 1) = 0$.

1C. A box contains 500 IC chips of which 100 are manufactured by company X and the rest by company Y. It is estimated that 10 % of the chips made by company X and 5 % made by company Y are defective. If a randomly selected chip is found to be defective, find the probability that it came from company X?

(4+3+3)

2A. Find the inverse Z-transform of $F(z) = \dfrac{2z^2 + 3z}{(z+2)(z-4)}$

2B. Let $\bar{X}$ and s^2 be the mean and variance of a random sample of size 25 from the population, follows $N(3, 100)$. Find $P\left(0 < \bar{X} < 6, \quad 55.2 < s^2 < 145.6\right)$.

2C. A box contains 12 items of which 4 are defective. A sample of 3 items is selected from the box. Let X denote the number of defective items in the sample. Find the probability distribution of X, Find E(X)and V(X).

(4+3+3)

3A. The random variable (X, Y) has the joint probability distribution given by $f(x,y) = \begin{cases} kxy, & 0 < x < 4, 1 < y < 5 \\ 0, & \text{else where.} \end{cases}$. Find the value of k and $COV(X,Y)$.

3B. Obtain the moment generating function (m.g.f.) of a Binomial distribution with parameter n and p. Hence find $E(X)$ and $V(X)$.

3C. In a Mathematics exam, the average marks was 82 and the standard deviation was 5. All the students with marks 84 to 90 received grade B. If the grades are normally distributed and 10 students received B grade, how many students took the exam?

(4+3+3)

4A. Solve the BVP $y'' + (1+x^2)y = -1, y(\pm 1) = 0$ using finite difference method with the given step size $h = \frac{1}{2}$.

4B. Solve the difference equation $y_{n+2} - 4y_n = n^2 + n - 1$.

4C. If $F(z) = \dfrac{2z^2 + 3z + 12}{(z-1)^4}$, find f_0, f_1, f_2 using initial value theorem.

(4+3+3)

5A. Solve the difference equation $y_{n+2} + 4y_{n+1} + 3y_n = 3^n$, $y_0 = 0, y_1 = 1$ using Z-transform.

5B. Suppose that the probability for A to win a game of tennis against B is 0.4. A has an option of playing either a best of 3 games or a best of 5 games of matches against B. Which option should A choose so that his probability of winning is greater?

5C. Two aeroplanes bomb a target in succession. Probability of each correctly attaining a hit is 0.3 and 0.2 respectively. Second one will bomb only if the first one will miss the target. Find the probability that (i) the target is hit (ii) target is hit by the second one (iii) both will fail

(4+3+3)

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