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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

## IV SEMESTER B.TECH. (Printing & Media)

## END SEMESTER EXAMINATIONS, APRIL 2017

SUBJECT: ENGINEERING MATHEMATICS IV [MAT 2212]

**REVISED CREDIT SYSTEM**
**(19/04/2017)**

Time: 3 Hours MAX. MARKS: 50

**Instructions to Candidates:**

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

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| **1A.** | Solve $\frac{\partial u}{\partial t} = \frac{1}{16}\frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1$ , $t > 0$, with $u(x,0) = 0 = u(0,t), u(1,t) = 100t$, compute u for one time steps with $h = \frac{1}{4}$, using Crank Nicolson's method | **04** |
| **1B.** | Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$ , $0 < x < 1, t > 0$ subjected to $u(x,0) = 100(x - x^2), \frac{\partial u}{\partial t}(x,0) = 0, u(0,t) = u(1,t) = 0$ taking $h = 0.25$. | **03** |
| **1C.** | A and B alternatively throw pair of dice. A wins if he throws sum 6 before B throws sum 7 and B wins if he throws sum 7 before A throws sum 6. If A starts the game then what is the chance of A winning ? | **03** |
| **2A.** | Solve $y'' + (1 + x)y' - y = 0,\ y(0) = y'(0),\ y(1) + y'(1) = 1$ by taking $h = 0.5$. | **04** |
| **2B.** | A player tosses 3 fair coins. He wins Rs 500 if 3 heads occur, Rs 300 if 2 head occur Rs 100 if one head occur. On the other hand, he loses Rs 1500 if 3 tails occur. Find the expected value of the game to the player. | **03** |
| **2C.** | Bus will arrive at a station has uniform distribution between 10 am to 10.15 am. Bus has not come for 8 min, what is the probability that it will come after 2 or more minutes completely? | **03** |
| **3A.** | Chances that the doctors diagnose disease 60% correctly. The chance that the patient will die after correct diagnosis is 40%. The chance of death by wrong diagnosis is 70%. If patient has died then what is the probability that his disease was diagnosed correctly? | **04** |
| **3B.** | Find the mean and variance of Poisson's distribution. | **03** |
| **3C.** | If X, Y, Z are uncorrelated random variables having standard deviation 5, 12, 9 respectively, then find the correlation coefficient between $(X + Y), (Y + Z)$. | **03** |
| **4A.** | Suppose the continuous random variable has joint PDF given by $f(x,y) = \begin{cases} k(x^2 + \frac{xy}{3}) & , 0 \le x \le 1\ ; 0 \le y \le 2 \\ 0, & otherwise \end{cases}$ find i) k (ii ) $P(X + Y \ge 1)$ | **04** |

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| **4B.** | The temperature X is normally distributed with mean 50, variance 4. Find the probability that the temperature lies between $48^o c \; and \; 53^o c$. | **03** |
| **4C.** | Solve the following transportation problem:<br>Destination<br>A B C D<br>Source I: 21 16 25 13 — 11<br>II: 17 18 14 23 — 13 Availability<br>III: 32 27 18 41 — 19<br>Requirement: 6 10 12 15 | **03** |
| **5A.** | Find the maximum value of $Z = 2x + 3y$ using graphical method<br>subjected to the constraints<br>$x + y \leq 30, \quad y \geq 3$<br>$0 \leq y \leq 12 \quad , \; 0 \leq x \leq 20.$<br>$x - y \geq 20$ | **04** |
| **5B.** | A manufacturer produces two types of models $M_1$ and $M_2$. Each $M_1$ model requires 4 hours of grinding and 2 hours of polishing, whereas each $M_2$model requires 2 hours of grinding and 5 hours of polishing. The manufacture has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works for 60 hours a week. Profit on an $M_1$model is Rs. 3 and on an $M_2$ model is Rs. 4. Whatever is produced in a week is sold in the market. Set up an L. P. P to maximize profit in a week. | **03** |
| **5C.** | Using simplex method maximize $Z = 5x_1 + 3x_2$<br>subjected to the constraints<br>$x_1 + x_2 \leq 2$<br>$5x_1 + 2x_2 \leq 10$<br>$3x_1 + 8x_2 \leq 12, \quad x_1 \geq 0, x_2 \geq 0$ | **03** |