B.E. MINING ENGINEERING FOURTH SEMESTER MN406 - STATISTICAL AND NUMERICAL METHODS

P. Pages: 3 GUG/W/18/1589 Time: Three Hours Max. Marks: 80 Notes: 1. All questions carry equal marks. 2. Use of non-programmable calculator is permitted. Find the real root of the equation $x^3 - 3x + 4 = 0$ by the method of false position correct to 1. 8 a) three decimal places. Solve the system of equations 8 b) $x_1 + 2x_2 + 3x_3 = 7$ $2x_1 + 7x_2 + 15x_3 = 26$ $3x_1 + 15x_2 + 41x_3 = 62$ by Crout's method OR 2. Find a real root of equation 8 a) $x + \log_{10}^{x} = 3.375$ by Newton-Raphson method correct to four decimal places. Solve the system of equations 8 b) 8x + 6y + 10z + 9w = 3310x + 7y + 8z + 7w = 327x + 5y + 9z + 10w = 314x + 10y + 6z + 5w = 23by Jacobi's method (5 iterations) 3. Use Taylor's series method to solve $\frac{dy}{dx} = 3x + y^2$, y(0) = 1, obtain the terms upto x^4 and 8 a) find y (0.2), y (0.3). 8 b) Find y (0.1) and y (0.2) from $\frac{dy}{dx} = 1 - 2xy$, y(0) = 0 by Runge-Kutta fourth order method. OR 4. Given the differential equation $\frac{dy}{dx} = 2x - y$, y(1) = 3, use Picard's method upto 3^{rd} 8 a) approximation and find y(1.6) correct to four decimal places. b) 8 Given $\frac{dy}{dx} = 2 + \sqrt{xy}$, y(1) = 1, find y (1.3) in steps of 0.1 using Euler's modified method.

5. Let X be a random variable giving the number of aces in a random draw of four cards a) from a pack of 52 cards Find the probability function and distribution function for X

h)

Let $f(x) = \begin{cases} C(1-x^2) & , & -1 \le x \le 1 \\ 0 & , & \text{otherwise} \end{cases}$

Find

- i) Constant C
- ii) Coefficient of skewness
- iii) Coefficient of kurtosis

OR

6. a) Let X be a random variable having density function

> $f(x) = \begin{cases} Cx \\ 0 \end{cases}$ $0 \le x \le 2$ • otherwise

Find

- Constant C i)
- ii) $P\left(\frac{1}{2} < X < \frac{3}{2}\right)$

iii)
$$P(X>1)$$

iv) Distribution function

b) Let

$$X = \begin{cases} 1 & \text{prob } \frac{1}{6} \\ 2 & \text{prob } \frac{1}{3} \\ 3 & \text{prob } \frac{1}{2} \end{cases}$$

Find

- i) Mean
- ii) Variance
- iii) Moment generating function
- iv) First four moments about origin

7. a) A die is thrown 8 times and it is required to find the probability that '3' will show

- Exactly 2 times i)
- At most 3 times ii)
- iii) At least 2 times

b) A sample of 200 dry battery cells tested to find the length of life produced following results.

Mean = 12 hours and standard deviation = 3 hours.

Assuming the data to be normally distributed, what percentage of battery cells expected to have life

- More that 15 hours i)
- ii) Between 11 hours and 14 hours.

OR

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8. a) Find the coefficient of correlation by rank to the following data.

38 42 Х 44 39 50 42 45 47 42 48 22 19 24 18 19 27 y : 24 19 16 20

- b) Find the equation of regression plane z = a + bx + cy to the following data
 - : 7 9 10 12 13 14 Х у : 12 8 9 15 16 14 : 20 22 13 19 15 17 Z

Also estimate z when x = 11 and y = 13

9. a) A rod is rotating in a plane about one of its ends. The following table gives the angle θ 8 radians through which the rod is turned for different values of time t seconds. Find the angular velocity when t = 0.7 seconds and angular acceleration when t = 0.8 seconds

b) Given $u_1 = 22$, $u_2 = 30$, $u_4 = 82$, $u_7 = 106$, $u_{12} = 206$, find u_8 by Lagrange's interpolation formula.

OR

10. a) Evaluate $\int_{1}^{2} \sqrt{x - \frac{1}{2}} dx$ using Simpson's rule by taking 11 ordinates.

b) Solve the difference equation $y_{n+2} + y_{n+1} + y_n = n^2 + 4^n$

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