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15MAT41

Fourth Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics - IV

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question front each module,

Module-I

- 1 a. Employ Taylor's series method, find $y(0.1)$ considering upto third degree term if $y(x)$ satisfies the equation $\frac{dy}{dx} = x - y$, $y(0) = 1$. (05 Marks)
- b. Using Runge-Kutta method of fourth order, find $y(0.1)$ for the equation $\frac{dy}{dx} = y - x$, $y(0) = 1$ taking $h = 0.1$. (05 Marks)
- c. Apply Milne's method to compute $y(1.4)$ correct to four decimal places given $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and following the data : $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$, $y(1.3) = 2.7514$. (06 Marks)

OR

- 2 a. Use Taylor's series method to find $y(4.1)$ given that $(x^2 + y)y' = 1$ and $y(4) = 4$. (05 Marks)
- b. Find y at $x = 0.8$, given $y' = x - y$ and $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$. Using Adams - Bashforth method. Apply the corrector formula. (05 Marks)
- c. Using Modified Euler's method find y at $x = 0.1$ given $y' = 3x + \frac{y}{2}$ with $y(0) = 1$ taking $h = 0.1$. (06 Marks)

Module-2

- 3 a. Obtain the solution of the equation $2y'' = 4x + y'$ with initial conditions $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$, $y(1.3) = 2.7514$ and $y(1.4) = 2.6725$, $y'(1.1) = 2.3178$, $y'(1.3) = 3.0657$ by computing $y(1.4)$ applying Milne's method. (05 Marks)
- b. If α and β are two distinct roots of $J_n(x) = 0$ then prove that $\int_{\alpha}^{\beta} x J_n(x) dx = 0$ if $\alpha \neq 0$. (05 Marks)
- c. Show that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$. (06 Marks)

OR

- 4 a. Given $y'' - xy' - y = 0$ with the initial conditions $y(0) = 1$, $y'(0) = 0$. Compute $y(0.2)$ and $y'(0.2)$ by taking $h = 0.2$ using Runge - Kutta method of fourth order. (05 Marks)
- b. If $(x^2 - x + 1) = aP_0(x) + bP_1(x) + cP_2(x) + dP_3(x)$ then, find the values of a , b , c , d . (05 Marks)
- c. Derive Rodrigue's formula

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$$

$$\frac{d^n}{dx^n} (x^2 - 1)^n$$

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(06 Marks)

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Module - 5

- 9 a. Explain the terms: (i) Null hypothesis (ii) type-I and type-II errors (iii) Significance level (05 Marks)
- b. In 324 throws of a six faced 'die', an odd number turned up 181 times. Is it reasonable to think that 'die' is an unbiased one? (05 Marks)
- c. Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball find the probabilities that after three throws (i) A has the ball (ii) B has the ball (iii) C has the ball. (06 Marks)

OR

- 10 a. Find the unique fixed probability vector for the matrix

$$\begin{vmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{vmatrix}$$

(05 Marks)

- b. A random sample for 1000 workers in company has mean wage of Rs. 50 per day and standard deviation of Rs. 15. Another sample of 1500 workers from another company has mean wage of Rs. 45 per day and standard deviation of Rs. 20. Does the mean rate of wages varies between the two companies? (05 Marks)
- c. A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribu

x	1	2	3	4	5	6
f	40	32	28	58	54	60

Calculate the value of χ^2 .

(06 Marks)

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