CBCS SCHEM

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17MAT41

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. From Taylor's series method, find y(0.1), considering upto fourth degree term if y(x) satisfying the equation $\frac{dy}{dx} = x - y^2$, y(0) = 1. **(06 Marks)**

b. Using Runge-Kutta method of fourth order $\frac{dY}{dx} + y = 2x$ at x = 1.1 given that y = 3 at x = 1 initially. **(07 Marks)**

c. If $\frac{dy}{dx} = 2ex - y$, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040 and y(0.3) = 2.090, find y(0.4) correct upto four decimal places by using Milne's predictor-corrector formula. **(07 Marks)**

OR

2 a. Using modified Euler's method find y at x = 0.2 given $\frac{dy}{dx} = 3x + \frac{1}{2}y$ with y(0) = 1 taking h = **0.1.** **(06 Marks)**

b. Given $\frac{dy}{dx} + y + zy^2 = 0$ and y(0) = 1, y(0.1) = 0.9008, y(0.2) = 0.8066, y(0.3) = 0.722. Evaluate y(0.4) by Adams-Bashforth method. **(07 Marks)**

c. Using Runge-Kutta method of fourth order, find y(0.2) for the equation $\frac{dy}{dx} = \frac{y - x}{y + x}$, y(0) = 1 taking h = 0.2. **(07 Marks)**

Module-2

3 a. Apply Milne's method to compute y(0.8) given that $\frac{d^2y}{dx^2} = 1 - 2y\frac{dy}{dx}$ and the following table of initial values.

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

(06 Marks)

b. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. **(07 Marks)**

c. Obtain the series solution of Bessel's differential equation $x^2y'' + xy' + (x^2 + n^2)y = 0$ leading to $J_n(x)$. **(07 Marks)**

OR

4 a. Given y'' - xy' - y = 0 with the initial conditions y(0) = 1, y'(0) = 0, compute y(0.2) y'(0.2) using fourth order Runge-Kutta method. **(06 Marks)**

b. Prove $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$. **(07 Marks)**

c. Prove the Rodfigues formula $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}(x^2 - 1)^n$ **(07 Marks)**

Module 3

5 a. Derive Cauchy-Riemann equations in Cartesian form. **(06 Marks)**

b. Discuss the transformation $w = z^2$. **(07 Marks)**

c. By using Cauchy's residue theorem, evaluate $\oint \frac{e^{2z}}{(z+1)(z+2)} dz$ if C is the circle |z| = 3. **(07 Marks)**

OR

6 a. Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ **(06 Marks)**

b. State and prove Cauchy's integral formula. **(07 Marks)**

c. Find the bilinear transformation which maps z = ∞, i, 0 into w = -1, -i, 1. **(07 Marks)**

Module 4

7 a. Find the mean and standard of Poisson distribution. **(06 Marks)**

b. In an examination 7% of students score less than 35 marks and 89% of the students score less than 60 marks. Find the mean and standard deviation if the marks are normally distributed given A(1.2263) = 0.39 and A(1.4757) = 0.43 **(07 Marks)**

c. The joint probability distributio

Y \ X	-2	-1	4	
1	0.1	0.2	0	0.3
2	0.2	0.1	0.1	0

Determine:

i) Marginal distribution of X and Y

ii) Covariance of X and Y

iii) Correlation of X and Y (07 Marks)

OR

8 a. A random variable X has the following robability function:

x	0	1	2	3	4	5	6	7
P(x)	0	K	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

Find K and evaluate P(x 6) P(3 < x 6). **(06 Marks)**

b. The probability that a pen manufactured by a factory be defective is 1/10. If 12 such pens are manufactured, what is the probability that

i) Exactly 2 are defective

ii) Atleast two are defective

iii) None of them are defective. **(07 Marks)**

c. The length of telephone conversation in a booth has been exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made

i) Ends in less than 5 minutes

ii) Between 5 and 10 minutes **(07 Marks)**

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Module-5

9 a. A die is thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Show that the dia cannot be regarded as an unbiased die. (06 Marks)

b. A group of 10 boys fed on diet A and another group of 8 boys fed on a different disk B for a period of 6 months recorded the following increase in weight (lbs):

Diet A:	5	6	8	1	12	4	3	9	6	10
Diet B:	2	3	6	8	10	1	2	8		

Test whether diets A aid B differ significantly t.05 = 2.12 at 16d1 (07 Marks)

c. Find the unique fixed probability vector for the regular stochastic matrix

$$A = \begin{matrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{matrix}$$

(07 Marks)

OR

10 a. Define the terms:

i) Null hypothesis

Type-I and Type-II error

iii) Confidence limits

(06 Marks)

h. The t.p.m. of a Markov chain is given by $P = \begin{vmatrix} 1/2 & 0 & 1/2 \\ 1 & 0 & 0 \\ 1/4 & 1/2 & 1/4 \end{vmatrix}$. Find the fined probabilities vector. (07 Marks)

c. Two boys B1 and B2 and two girls G1 and G2 are throwing ball from one to another. Each boy throws the ball to the Other boy with probability 1/2 and to each girl with probability 1/4. On the other hand each girl throws the ball to each boy with probability 1/2 and never to the other girl. In the long run how often does each receive the ball? (07 Marks)