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10MAT41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Using Taylor series method, solve $\frac{dy}{dx} = x^2 + y^2$, y(0) = 1 at the point x.= 0.2, 0.3 consider up to 4th degree term. (06 Marks)

b. Using Runge Kutta method of order 4, solve $\frac{dY}{dx} = \frac{Y^2}{Y^2} \times \frac{2}{x^2}$ with y(0) = 1 at x = 0.2, 0.4 by taking step length h0.2. (07 Marks)

c. Given $\frac{dx}{} = \frac{1}{2}$ xy, y(0) = 1, y(0.1) =1.0025, y(0.2)=1.0101, y(0.3)=1.0228. Compute y at x = 0.4 by Adams – Bash forth predictor – corrector method use corrector formula twice. (07 Marks)

2 a. Evaluate y and z at x = 0.1 from the Picard's second approximation to the solution of the following system of equations given by y = 2 and z = 1 at x 0 initially $\frac{dy}{dx} = x + z$

$\frac{dz}{dx} \quad x\ Y$ (06 Marks)

b. Given y'' = x^3 (y + y') with the initial condition y(0) = 1 y'(0) = 0.5 compute y(0.1) by taking h = 0.1 and using 4th order Runge Kutta method. (07 Marks)

C. Applying Milne's method compute y(0.4) Given that y satisfies the equation $\frac{d^2y}{dx} + 3x\frac{dy}{dx} - 6y = 0$ and y and y' are governed by the following values
y(0) = 1, y(0.1) = 1.03995, y(0.2) = 1.138036
y(0.3) = 1.29865, y'(0) = 0.1, y'(0.1) = 0.6955
y'(0.2) = 1.258, y'(0.3)=1.873. (07 Marks)

3 a. Derive Cauchy Riemann Equation in Cartesian form. (06 Marks)

b. Prove that for every analytic function f(z) = u + iv the two families of curves u(x,y) = CI and v(x,y) = C2 form an orthogonal system. (07 Marks)

C. If u – v = (x – y) (x^2 + 4xy + y^2) and f(z) = u + iv is analytic function of z = x + iy find f(z) interms of f(z). (07 Marks)

4 a. Find the bilinear transformation that maps the points z 0, i, Go onto the points w = 1, – i, –1 respectively, find the invariant points. (06 Marks)

b. Discuss the transformation w = e^z. (07 Marks)

c. Evaluate $\int \frac{\sin TCZ^2 + COSTCZ^2}{(z-1)^2 (z-2)} dz$, where c is the circle IzI = 3. (07 Marks)

PART — B

5 a. Starting from Laplace differential equation. Obtain Bessel's differential equation as $xy'' + xy' + (x^2 - n^2)y = 0$ (08 Marks)

b. If $x^3 + 2x^2 - x + 1 = a\,Po(x) + b\,Pi(x) + c\,P2(x) + d\,P3(x)$ find the value of a, b, c, d. (06 Marks)

c. Derive Rodrigue's formula $P_n = \frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2 - 1)^n$ (06 Marks)

6 a. Define axioms of probability. Prove that,
$P(A \cup B \cup C) = P(A) + P(B) + P(C) + P(A \cap B \cap C) - P(A \cap B) - P(B \cap C) - P(C \cap A)$ (06 Marks)

b. A solar water heater manufactured by a company consists of two parts the heating panel and the insulated tank. It is found that 6% of the heaters produced by the company have defective heating panels and 8% have defective tank. Find the percentage of non defective heaters produced by the company. (07 Marks)

c. 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. (07 Marks)

7 a. A random variables X takes the values —3, —1, 2 and 5 with respective probabilities

2k-3	k—	2 k	—1 k+1
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Find the value of k and i) p(—3 < x < 4) ii) p(x < 2). (06 Marks)

b. Find the mean and variance of binomial distribution. (07 Marks)

c. In an examination 7% of students scores less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation of the marks are normally distribute, it is given that P(0 < z < 1.2263)- 0.39 and P(0 < z < 1.4757) = 0.43. (07 Marks)

8 a. Explain the following terms :
i) Null hypothesis
ii) Type I and Type II error
iii) Confidence limits. (06 Marks)

b. A coin is tossed 1000 times and it turn up head 540 times decide on the hypothesis that the coin is unbiased. (07 Marks)

c. A certain stimulus administered to each of the 12 patients resulted is the following change is blood pressure 5, 2, 8, —1, 3, 0, 6, —2, 1, 5, 0, 4 can it be calculated that the stimulus will increase the blood pressure (to 05 for 11 df 2.201.) (07 Marks)

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