**CBNST**

QUESTION BANK

1. **Define ‘Absolute error’ and ‘Relative error’. An approximate value of** u **is given by .1428571 and its true value is 3.1415926.Find absolute and relative errors.**
2. **In normalized floating point mode, carry out the following mathematical operation: (.4546 E 3) + (.5454 E 8)**
3. Apply the procedure for the following multiplication:

(. 5334 ✕ 109) ✕ (. 1132 ✕ 10–25)

Indicate if the result is overflow or underflow.

1. **In performing numerical calculations, how many types of errors are encountered? Write each type of errors and discuss them by giving examples.**
2. **Multiply the following floating point numbers: (i) .1111 E 51 and .4444 E 50**

(ii) .1234 E -49 and .1111 E -54

1. **Subtract the following floating-point numbers :**

0. 46132447 ✕ 108 **and** 0. 46123568 ✕ 108

1. **Find the sum of** . 234 ✕ 103 **and** . 478 ✕ 102 **and write the result in three – digit mantissa.**
2. **Add the number** 0. 1125 ✕ 10–3 **&** 0. 4798 ✕ 10–4 **using normalized floating point concept.**
3. **Subtract** 0. 4688 ✕ 108 **from** 0. 1544 ✕ 107 **using normalized floating point concept.**
4. Define absolute error and relative error.If true value = 10 and approximate value

3

is 3.33 , then find absolute and relative errors.

2 2

1. **Find the relative error involved in rounding and truncating 4.9997 to 5.000.**
2. **Evaluate** √2 **corrected to four decimal places by Newton-Raphson method.**

1

1. **Find a positive value of** (17) /3 **correct to four decimal places by Newton-Raphson method.**
2. **Find the real root of the equation** 2x — log 10x — 7 = 0 **using iteration method.**
3. Find a real root of cos x = 3x + 1 , correct to four decimal places using iteration

method

1. **Find the rate of convergence for Regula-Falsi method.**
2. **Find the root of the equation** xex = cos x **correct to four decimal places by using secant method.**

2

**Find the root of the following equation in the interval** [0, 1] **by Regula-Falsi method:**

2x(1 — x2 + x)Ln x = x2 — 1

1. **Find the real root of the equation** x3 + x2 — 1 = 0 **on the interval** [0, 1] **with the ccuracy of** 10–4 **by iteration method.**
2. Find a root of the equation tan x + tanM x = 0 which lies in the interval (1.6,3.0) correct to four significant digits using method of false position.
3. **Prove that Bisection method always converges.**
4. **If the equation** x6 — x4 — x3 — 1 = 0 **has one real root between 1.4 and 1.5, using Newton-Raphson method, find the root correct up to 4 decimal places**

0

1. Prove that the order of convergence of Newton – Raphson method is quadratic.

n

1. **Find a positive real root of the equation** x3 — 4x — 9 = 0 **by Newton-Raphson method.**
2. Apply False Position method to find the smallest positive root of the equation

x — e–x = 0, **correct to three decimal places.**

1. Solve the following system of equations using Gauss-Elimination method:

x + y + 2z = 4 ; 2x — y + 3z = 9 ; 3x — y — z = 2

1. **Solve the following system of equations by Gauss Elimination method(three iteration):**

x — y + z = 1 ; —3x + 2y — 3z = —6 ; 2x — 5y + 4z =**5**

1. **Solve the following system of equations with pivoting by Gauss-Elimination method:**

1. 4 x + 2. 3 y + 3. 7 z = 7. 4

3. 3 x + 1. 6 y + 4. 3 z = 9. 2

2. 5 x + 1. 9y + 4. 1 z = 8. 5

1. **Solve the following equations by Gauss elimination method:**

3x1 + 2x2 — 5x3 = 0 ; 2x1 — 3x2 + x3 = 0 ; x1 + 4x2 — x3 = 4

The answer should be correct to 3 significant digits.

1. What do you understand by ill – conditioned equations ? Consider the following system of equations:

100x — 200y = 100 ; —200x + 401y = —100

Determine, whether given system is ill-conditioned or not.

Or

What do you understand by ill – conditioned system of equations? Illustrate your answer with the help of suitable examples.

1. Solve the following system of equations using Gauss-Seidel method:

10x + y + z = 12 ; 2x + 10y + z = 13 ; 2x + 2y + 10z = 14

1. **Apply Gauss-Seidel iteration method to solve the following equations(three iterations only):**

20 x + y — 2z = 17 ; 3x + 20y — z = —18 ; 2x — 3y + 20z = 25

1. **Solve the following set of equation by Gauss-Seidel iterative method:**

3x1 + 2x2 — x3 = 7 ; 5x1 — 3x2 + 2x3 = 4 ; —x1 + x2 — 3x3 = —1

1. **Use Gauss-Seidel iterative method to solve the following system of simultaneous**

equations:

9x + 4y + z = —17 ; x — 2y — 6z = 14 ; x + 6y = 4

1. **Prove the following:**

**(i)** E = 1 + ∆ **(ii)** ∆ = # (1 — #)–1

1 –1 ∆ #

**(iii)** ð = E /2 + E /2

**(iv)** # + ∆= —

# ∆

**(v)** E = eMD **(vi)** # = 1 — E–1

1. **Given** log x **for** x = 40, 45, 50, 55, 60 **and** 65 **according to the following table:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x | **40** | **45** | **50** | **55** | **60** | **65** |
| log x | **1.60206** | **1.65321** | **1.69897** | **1.74036** | **1.77815** | **1.81291** |

**Find the value of** log 58. 75 **.**

1. **The table gives the distance** (y) **in km, of the vision horizon for the given heights**

(x) in meter above the earth’s surface:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| x | **100** | **150** | **200** | **250** | **300** | **350** | **400** |
| y | **10.63** | **13.03** | **15.04** | **16.81** | **18.42** | **19.90** | **21.27** |

Use Newton-Gregory’s forward interpolation formula to find the value of y when

x = 160 **m.**

1. **The following table gives the population of a town during the last six censuses. Estimate the population in 1913 by Newton’s forward difference formula:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | **1911** | **1921** | **1931** | **1941** | **1951** | **1961** |
| **Population (in thousand)** | **12** | **15** | **20** | **27** | **39** | **52** |

1. **Derive the Newton’s Gregory formula for forward interpolation.Hence obtain the value of** †(2. 5) **from the following data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | **2** | **4** | **6** | **8** | **10** |
| †(x) | **15** | **10** | **5** | **7** | **13** |

1. **Find the polynomial of degree four which takes the following values:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | **2** | **4** | **6** | **8** | **10** |
| y | **0** | **0** | **1** | **0** | **0** |

1. **Find the order of the polynomial which might be suitable for the following function:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | **2.0** | **2.1** | **2.2** | **2.3** | **2.4** | **2.5** | **2.6** | **2.7** |
| †(x) | **0.577** | **0.568** | **0.556** | **0.540** | **0.520** | **0.497** | **0.471** | **0.442** |

Also find the value of †(2. 15) using difference formulae.

1. **From the following table:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | **10**° | **20**° | **30**° | **40**° | **50**° | **60**° | **70**° | **80**° |
| cos x | **.9848** | **.9397** | **.8660** | **.7660** | **.6428** | **.5000** | **.3420** | **.1737** |

**Calculate** cos 25° **and** cos 73° **using Gregory Newton formula.**

1. **What do you mean by interpolation? When a function is tabulated at equal intervals, obtain a more concise Lagrange’s interpolation formula.**
2. **Derive the Newton-divided difference formula,hence calculate** †(3) **from the following data:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x | **0** | **1** | **2** | **4** | **5** | **6** |
| † | **1** | **14** | **15** | **5** | **6** | **19** |

1. **Find the unique polynomial P(n) of degree two such that : P(1) =1 , P(3) = 27 , P(4) = 64**

Use Lagrange’s method of interpolation.

1. Value of †(x) for values of x are given as:

†(1) = 4, †(2) = 5 , †(7) = 5 , †(8) = 4

Find †(6) and also the value of ‘x’ for which †(x) is maximum or minimum using Lagrange’s formula.

1. Use the Lagrange’s and the Newton Divided difference formulas to calculate †(3)

from the following table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x | **0** | **1** | **2** | **4** | **5** | **6** |
| † | **1** | **14** | **15** | **5** | **6** | **19** |

1. Using the following table,apply Gauss forward formula to get †(3. 75) :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| x | **2.5** | **3.0** | **3.5** | **4.0** | **4.5** | **5.0** |
| †(x) | **24.145** | **22.043** | **20.225** | **18.644** | **17.262** | **16.047** |

1. **Find** y(1), **if** y(x) **is the solution of** dy = x2 + y2 **by Runge-Kutta method, in two**

dx

**steps taking** M = 0. 5 , **given** y(0) = 0.

1. **Write Newton-Cote’s quadrature formula.**

6

1. **Evaluate** dx 0 1+x2

ƒ

by using Simpson’s one third rule.

1. **A train is moving at the speed of 30 m/sec.Suddenly brakes are applied. The speed**

Of the train per second after ‘t’ seconds is given by :

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time (t)** | **0** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** | **45** |
| **Speed(v)** | **30** | **24** | **19** | **16** | **13** | **11** | **10** | **8** | **7** | **5** |

Apply Simpson’s three-eight rule to determine the distance moved by the train in 45 seconds.

1. **A rod is rotating in a plane.The following table gives the angle** 8 **(in radians) through which the rod has turned for various values of time t (seconds). Calculate the angular velocity of the rod at t = 0.6 seconds.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **t** | **0** | **0.2** | **0.4** | **0.6** | **0.8** | **1.0** |
| 8 | **0** | **0.12** | **0.49** | **1.12** | **2.02** | **3.20** |

1. **Write a computer program in ‘C’ for the trapezoidal rule of integration.**
2. Find an approximate value of 2 x–1dx using composite Simpson’s rule

ƒ1

(Simpson’s 1 rule) with h=0.25 .Give a bound on the error.

3

u

/

1. **Compute** ƒ0 2 sin x dx **using Simpson’s three – eighth rule of integration, taking**

**h=** u .

18

1. **Find** y(2), **if** y(x) **is the solution of** dy = 1 (x + y) **using Runge-Kutta method,**

dx 2

**in two steps taking** M = 1. 0 **. Given** y(0) = 2. 0.

1. **Given that :** dy = 1 + y2

dx

**and** y(0. 6) = 0. 6841 , y(0. 4) = 0. 4228 , y(0. 2) = 0. 2027 , y(0) = 0.

Find y(—0. 2) using Milne’s Predictor – Corrector method.

1. **Using Runge-Kutta method of fourth order,solve for y(0.1), y(0.2) and y(0.3) Given that** y’ = xy + y2 , y(0) = 1.
2. **Given** dy = y — x **,** y(0) = 2 **.Find y(0.1) and y(0.2) correct to four decimal places**

dx

by using fourth order Runge-Kutta Method.

6

1. **Compute the value of** ‘y’ **at** x = 1. 4 **.** dy = xy + x2 —1 ; M = 0. 1 **using Predictor-**

dx

Corrector method.

1. **Find an approximate value of** ƒ x–1 dx **using composite Simpson’s Rule with** M = 0. 25 **.Give a bound on the error.**

2

1

1. Explain the method of least squares to fit a curve.Hence obtain a second degree parabola from the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x** | **0** | **5** | **10** | **15** | **20** | **25** |
| **y** | **1.5** | **6.2** | **15.3** | **20.0** | **23.7** | **28.6** |

1. What straight line best fits the following data:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | **1** | **2** | **3** | **4** |
| y | **0** | **1** | **1** | **2** |

in the least square sense.

1. The velocity V of a liquid is known to vary with temperature T,according to a quadratic law V = a + bT + cT2.Find the best values of a,b and c for the following table :

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **T** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **V** | **2.31** | **2.01** | **1.80** | **1.66** | **1.55** | **1.47** | **1.41** |

1. **Fit a second degree curve of regression of ‘y’ on ‘x’ to the following data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | **1.0** | **2.0** | **3.0** | **4.0** |
| y | **6.0** | **11.0** | **18.0** | **27.0** |

1. Fit the curve prn = K to the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| p(Kg/cm 3) | **0.5** | **1.0** | **1.5** | **2.0** | **2.5** | **3.0** |
| r (litres) | **1620** | **1000** | **750** | **620** | **520** | **460** |

1. Using the method of least square fit the non-linear curve of the form y = aebx to the following data:

|  |  |  |  |
| --- | --- | --- | --- |
| **x** | **0** | **2** | **4** |
| **y** | **5.012** | **10** | **31.62** |

1. State some important curve-fitting procedures. Obtain the least squares fit of the form †(t) = ae–3t + be–2t for the data :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| t | **0.1** | **0.2** | **0.3** | **0.4** |
| †(t) | **0.76** | **0.58** | **0.44** | **0.35** |

1. **Obtain the cubic spline for the following data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | **0** | **1** | **2** | **3** |
| y | **2** | **-6** | **-8** | **2** |

1. **What is Regression analysis? Describe the method of least square to obtain the Regression lines.**
2. **In trivariate distribution,the following data have been obtained:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X1 | **1** | **2** | **3** | **4** |
| X2 | **0** | **1** | **2** | **3** |
| X3 | **12** | **18** | **24** | **30** |

**Find the regression equation of** X3 **on** X1 **and** X2**.**

1. **Obtain a regression plane by using multiple linear regression to fit the data given**

below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | **1** | **2** | **3** | **4** |
| y | **0** | **1** | **2** | **3** |
| z | **2** | **3** | **4** | **5** |

1. For 10 observations on price ‘x’ and supply ‘y’ ,the following data were obtained:

∑ x = 130 , ∑ y = 220 , ∑ x2 = 228 , ∑ y2 = 5506 , ∑ xy = 3467 .

Obtain the line of regression of ‘y’ on ‘x’ and estimate the supply when the price is 16 units.

1. Find the two lines of regression and coefficient of correlation for the data given below:

n = 18 , ∑ x = 12 , ∑ y = 18 , ∑x2 = 60 , ∑ y2 = 96 , ∑ xy = 48

1. **Explain the following terms clearly:**
   * 1. **Null Hypothesis**
     2. **Level of significance**
2. **A manufacturer claims that only 4% of his products supplied by him are defective. A random sample of 600 products contained 36 defectives. Test the claim of the** manufacturer.
3. Write the t-test for difference of means of two small samples.
4. **Records taken of the number of male and female births in 800 families having four children are as follows:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No. of male births** | **0** | **1** | **2** | **3** | **4** |
| **No. of female births** | **4** | **3** | **2** | **1** | **0** |
| **No. of families** | **32** | **178** | **260** | **236** | **94** |

1. **A survey of 320 families with 5 children shows the following distribution:-**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of Boys & Girls** | **5**  **boys 0**  **girls** | **4**  **boys 1**  **girls** | **3**  **boys 2girls** | **2**  **boys 3**  **girls** | **1**  **boys 4**  **girls** | **0**  **boys 5**  **girls** | **Total** |
| **Number of Families** | **18** | **56** | **110** | **88** | **40** | **8** | **320** |

Given that 32 for 5 degree of freedom are 11.1 and 15.1 at 0.05 and 0.01 significance level respectively, test the hypothesis that male and female births are equally probable.

1. A die is thrown 90 times and the number of faces shown are as indicated below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Faces** | **1** | **2** | **3** | **4** | **5** | **6** |
| **Frequency** | **18** | **14** | **13** | **15** | **14** | **16** |

**Test whether the die is fair. (Given** 35 = (. 05) = 11. 07)

1. **Given the following information about two samples drawn from two normal**

population:

n1 = 8 , ∑(x — x¯)2 = 94. 5 , n2 = 10 & ∑(y — y¯)2 = 101. 7.

**Test the equality of two popular variances .(Given** F7,9(. 05) = 3. 29 **.**

1. **1Write short notes on the following:**
   1. **Fourth order Runge-Kutta method for solving O.D.E.**
   2. **Moving Averages**
   3. **Multiple Regressions**
   4. **Representation of floating point numbers**
   5. **Frequency charts of statistical documentation**
   6. **Statistical quality control charts**
   7. **Hermite’s interpolation**
   8. **Forecasting models and methods**
   9. **F-test and t-test**
   10. **Chi – square test**
   11. **ANOVA**
   12. **Statistical quality control method**