**HUMANITIES AND BASIC SCEINCES DEPARTMENT**

**MILITARY COLLEGE OF SIGNALS, NUST**

**NUMERICAL ANAYLYSIS BESE-15(A&B)**

**Exam : Final Semester Instructor : Gp Capt Umar Farooq(R)**

**Type of paper : Regular Total Marks : 50**

**Semester : Spring Time Allowed : 2 hour s 30 Minutes**

**NOTE: ATTEMPT ALL QUESTIO**

**Question, No1**

A personal computer uses 32 bit strings, in compliance of the IEEE 754 Standards, to represent single-precision real number. How the machine might represent in floating-point mode

in its memory? How ‘- ’ will be represented by the same machine? (5)

**Question, No2**

Can f(x) = be expanded in Taylor series about

Determine the degree of the Taylor polynomial expanded about 0 that should be used to

approximate so that the error is less than. (7)

**Question, No3**

Determine the Taylor polynomial of degree N=4 for f(x) =) dt expanded about 0.

Assume that ) dt =0.90425. (5)

**Question, No4**

Why higher degree polynomial is not recommended for ‘Interpolation’? Let f(x) =2sin (). Use quadratic Lagrange interpolation based on the nodes 0,1and 3 to approximate f(3.5) . (5)

**Question, No5**

Fit the following data, population of a country (in million), in the curve P (t) = , assume the L= 8

|  |  |  |
| --- | --- | --- |
| Year |  |  |
| 1995 | -10 | 5.3 |
| 2000 | -5 | 23.2 |
| 2005 | 0 | 76.1 |
| 2010 | 5 | 152.3 |

(7)

**Question, No6**

Use Newton – Raphson method to solve =0.Do sufficient number of iterations so that the relative error of the answer is less than . You need to find the initial guess yourself.

(5)

**Question, No7**

Integrate dx using Simpson’s rule with M=5. (5)

**Question, No8**

Determine the number M and the interval width h so that the composite Trapezoidal rule for M subintervals can be used to compute with an accuracy of. (5)

**Question, No9**

Show that Euler’s method fails to approximate the solution of I.V.P. with y (0) = 0 and h=1. Justify your answer. What difficulties are encountered?

Apply the Heun’s method to find y () and y () for the following O.D.E. with h=1:-

, y (0) =0. (6)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Find the number in base ten. (4)

**Question, No2** (8)

Approximate =0 by a polynomial of degree ‘n’ using Taylor’s Theorem.

Show that if then the an approximation has the error bound

**Question, No3** (7)

Let .Use cubic Lagrange interpolation based on nodes to approximate.

**Question, No4** (7)

Find the least- squares line for the following data:-

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | -8 | -2 | 0 | 4 | 6 |
|  | 6.8 | 5.0 | 2.2 | 0.5 | -1.3 |
|  | 7.32 | 3.81 | 2.64 | 0.30 | -0.87 |

Consider the following relations on the set of integers:-



Which of the above mentioned relations are symmetric and which are antisymmeyric?

**Question, No6** (5)

What is an equivalence relation? Show that the relation  is an equivalence relation.

**ELECTRICAL ENGINEERING DEPARTMENT**

**MILITARY COLLEGE OF SIGNALS, NUST**

**CALCULUS**

**TE- 47(D)**

**Exam : Mid Semester Instructor : Umar Farooq**

**Semester : Regular Total Marks : 30**

**Semester : Fall Time Allowed : 1 hour 30 Minutes**

**NOTE: ATTEMPT ALL QUESTION**

**Question, No1** (5)

Graph the function defined below:-

f

Then discuss, in complete detail, limits and continuity of the function at each of the points 

(6) **Question, No2** (5)

Does the graph of the function defined below have a vertical tangent at the origin? Give reasons for your answer.



P.T.O.

**Question, No3** (5)

Find the equation for the line perpendicular to the tangent to the curve  at the point .What is the smallest slope of the curve. At what point on the curve does the curve have this slope?

**Question, No4** (5)

Find the solution of the equation, where is a complex number:-



**Question, No5** (5)

Find the locus of the points in the complex plane satisfying each of the given conditions



**Question, No6** (5)

Show that:-



is differentiable at .Give full details in your answer.

(a) If the truth value of is ‘F’, what will be the truth value of 

(b) Determine, **logically**, whether the proposition is a tautology.

**Question, No3** (5)

Find the simplest possible conclusion of the following set of hypothesis:-

(a) 

(b) 

**Question, No4** (5)

Prove that the propositions () are logically equivalent.

What simpler statement is logically equivalent to both of them?

**Question, No5** (5)

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Which of the above mentioned relations are symmetric and which are antisymmeyric?

**Question, No6** (5)

What is an equivalence relation? Show that the relation  is an equivalence relation.