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M.Sc 1<sup>ST</sup> SEMESTER REGULAR EXAMINATIONS, NOV/DEC 2019-20  
MTPC105

NUMERICAL ANALYSIS AND ITS APPLICATIONS

Time: 3 Hours Max Marks: 80

The figures in the right hand margin indicate marks.

SECTION A

Q.1 Answer any four of the following: [ 4 X4 =16]

- a Determine the step size h that can be used in the tabulation of f (x) = sinx in that interval [1, 3] so that linear interpolation will be correct to four decimal places after rounding off.
b Explain briefly about quadratic interpolation
c Explain briefly about iterated interpolation
d Explain briefly about Lagrange bivariate interpolating polynomial.
e The following data for a function f(x, y) is given: Find f(0.25, 0.75) using linear interpolation.

Table with 3 columns (y\x, 0, 1) and 3 rows (0, 1, 1) containing numerical values for function interpolation.

- f What is the use of Trapezoidal method and explain its formula OR

2. Answer all questions from the following [2 x 8 =16]

- a Explain about interpolating polynomial
b Write about Newton divided difference interpolation
c State Weierstrass approximation and coordinate function
d Obtain the rational approximation of the form (a0+a1x)/(b0+b1x+b2x^2) to e^x.
e Explain about linear and quadratic interpolation
f Find the approximation value to integral from 0 to 1 of (sinx/x) dx using mid point rule and two point open type rule
g Evaluate the integral integral from y=1 to 1.5 integral from x=1 to 2 of (dxdy)/(x+y) using the Simpsons rule with h=0.5 and y= 0.5 compare with exact solution
h Define difference equation and give an example.

SECTION-B

3. Answer all Questions: [16 x4 =64]

- a Calculate the nth divided difference of 1/x , based on the points xo, x1, x2,..... xn. OR
b Obtain the least squares polynomial approximation of degree one and two for f(x) = x^(1/2) on [0, 1]

4. a Find the quadrature formula integral from 0 to 1 of (dx)/(sqrt(x(1-x))) = alpha1 f(0) + alpha2 f(1/2) + alpha3 f(1) which is exact for polynomials of highest possible degree. Then use the formula on integral from 0 to 1 of (dx)/(sqrt(x-x^3)) and compare with the exact value.



OR

- b Evaluate the integral

$$\int_0^1 \frac{dx}{1+x}$$

using composite trapezoidal rule, composite Simpsons rule with 2,4 and 8

equal subintervals

5.

- a Evaluate the integral  $\int_1^2 \int_1^2 \frac{xdy}{x+y}$  using the trapezoidal rule with  $h = k = 0.5$  and  $h = k = 0.25$ . Improve the estimate using Romberg integration

OR

- b Find the solution of the initial value problem  $\frac{du}{dt} = -2tu^2, u(0) = 1$

Using 4<sup>th</sup> order R-K method.

6.

- a Solve the initial value problem  $u' = -2tu^2, u(0)=1$  with  $h=0.2$  on the interval  $[0, 0.4]$  using the backward Euler method.

OR

- b Given the initial value problem  $u' = t^2 + u^2, u(0) = 0$  determine the first three non zero

Terms in the Taylors series for  $u(t)$  and hence obtain the value for  $u(1)$ . Also determine  $t$  when the error in  $u(t)$  obtained from the first two non zero terms is to be less than  $10^{-6}$  after rounding off.