B.Tech. SEM -V Production 2014 Course (CBCS) : SUMMER - 2019

SUBJECT : NUMERICAL METHODS

Day : Wednesday
Date : 15/05/2019

S-2019-2694

Time : 10.00 AM TO 01.00 PM
Max. Marks : 60

N. B. :

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.
4) Assume suitable data, if necessary.

Q. 1 **a)** What are significant digits? Explain with example the statements that describe the notion of significant digits. **(05)**

b) Explain with example accuracy and precision of significant digits. **(05)**

OR

a) Suppose that you have a task of measuring the lengths of a bridge and a river and come up with 9999 m and 9 m respectively. If the true values are 10,000 m and 10 m respectively, compute: **(05)**

i) The error

ii) The percentage relative error in each case

b) Explain Truncation and rounding off errors with example. **(05)**

Q. 2 Using Bisection method, find the root of the equation : **(10)**

$x^2 + x - \cos x = 0$ at the end of 6^{th} iteration.

OR

Use Newton Raphson method to find root of the function : **(10)**

$3x^3 - 9x^2 + 8 = 0$ at the end of 5^{th} iteration.

Q. 3 Solve the following system of equations by Gauss elimination method: **(10)**

$$x + 4y - z = -5$$
$$x + y - 6z = -12$$
$$3x - y - z = 4$$

OR

Solve the following system of equations by Gauss Seidel method: **(10)**

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

Q. 4 Construct the interpolating polynomial that fits the data given below using Newton's forward and backward difference interpolation. Hence find the value of $f(x)$ *at* $x = 0.15$ and 0.45. **(10)**

x	0	0.1	0.2	0.3	0.4	0.5
$f(x)$	−1.5	− 1.27	− 0.98	− 0.63	− 0.22	0.25

P. T. O.

OR

Find the least square approximation of the form $y = a + bx$ for the data. **(10)**

x	0	1	2	3	4
$f(x)$	1	2.9	4.8	6.7	8.6

Q. 5 The velocity of a particle at a distance 's' from a point on its path is given in the table below: **(10)**

S (meters)	0	10	20	30	40	50	60
V (m/sec)	47	58	64	65	61	52	38

Estimate the time taken to travel 60 meters by using Simpson's $1/3^{rd}$ rule.

OR

From the following table of values of x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x =1.2 and $x = 1.4$ **(10)**

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

Q. 6 Using modified Euler's method find an approximate value of y when: **(10)**

$x = 0.2$, Given $\frac{dy}{dx} = x + y$ and $y(0) = 2$; take $h = 0.1$.

OR

Using Runge – Kutta's fourth order method find the approximate value of : **(10)**

y for $x = 0.1$, Given that $\frac{dy}{dx} = xy + y^2$ and $y(0) = 1$. Take $h = 0.05$.

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