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SARDAR PATEL UNIVERSITY

M.Sc. Renewable Energy Examination (Semester –III)

Tuesday, 25-10-2016, Time: 02.00 to 05.00P.M

PS03CSYT02: Numerical Method and Computer Programming

Total Marks: 70

Q-1 Select most appropriate answer **(8x1=8)**

1. The Newton-Raphson successive approximations are $x_3, x_{34} \dots \dots x_{n+1}$
   a) $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ b) $log_{10} y = alog_{10} e + bx \, log_{10} e$
   c) $log_{10} y = log_{10} a + x \, log_{10} b$ d) none of the above
2. The First Forward Function of Difference $y = f(x)$ is
   a) $\Delta y_n = y_{n+1} - y_n$ b) $\Delta y_n = y_n - y_{1+n}$
   c) $\Delta y_n = y_{n+1} + y_\Delta$ d) $\Delta y_n = y_{-1} - y_n$
3. The Second Backward Difference $y = f(x)$ is
   a) $\nabla^2 y_n = \nabla y_n - \nabla y_{n-1}$ b) $\Delta y_n = y_{n+1} - y_n$
   c) $\nabla y_n = y_n - y_{n-1}$ d) $\Delta^2 y_n = \Delta y_{n+1} - \Delta y_n$
4. A straight line can be fitted to the given data by the method of least square
   a) $y = a + bx$ b) $y = a + bx + cx^2$
   c) $y = a^{ebx}$ d) $y = ax + bx^2$
5. In the Newtons Forward difference formula what is
   a) $u = \frac{x-x_n}{h}$ b) $u = x - x_n$
   c) $u = \frac{(x-x_n)^2}{h}$ d) $u = \frac{x-x_0}{h}$
6. Simpson's one-third rule is better than the Trapezoidal and Simpson's three-eight rules
   a) True b) False
7. Which is known as parabolic formula
   a) Simpson's 1/3 rule b) Simpson's 3/8 rule
   c) Trapezoidal rule c) Euler's rule
8. $y_{n+1} = y_n + hf(x_n, y_n)$ is the iterative formula for
   a) Euler's Method b) Taylor Method
   c) Milne' Method d) Principle of least Square

Q-2 Answer <u>any seven</u> questions **(7x2=14)**

1. Find the real root of $f(x) \equiv x^3 - 2x - 5 = 0$ by bisection method. Calculate f(2) and f(3).
2. Solve three decimal place $x^4 - 12x + 7 = 0$, x=2 by Newton-Raphson method
3. Using Lagrange's formula for inverse interpolation, find value of x for which $y = 7$

x	1	3	4
y	4	12	19

4. The index numbers from 1981 to 1987 in interval of 2 years are as given below

Year	1981	1983	1985	1987
Index number	100	125	137	151

Find the index number for the year 1982 by Newton-Gregory forward difference interpolation formula.

5. By the method of least square find the straight line that best fits for the following data

x	1	2	3
y	14	27	40

6. Fit a second degree parabola curve $y = a + bx + cx^2$

x	1	2	3	4
y	6	11	18	27

7. Taylor's series method to compute $y\ (0.1)$ correct to four decimal places for $\frac{dy}{dx} = 1 + xy$, given that $x = 0, y = 1$.
8. Use Euler's method with $h = 0.1$, to find the solution of the equation $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 0$, in the range $0 \le x \le 0.5$
9. Evaluate $\int_0^4 e^x\ dx$, using Simpson's 1/3 rule.

x	0	1	2	3	4
e^x	1	2.72	7.39	20.09	54.60

Q.3 (A) Find the approximate value for the real root of the equation $x^3 - 3x + 4 = 0$ using the method of false position three times in succession if $x_1 = -2$ and $x_2 = -3$ **(06)**

Q.3 (B) The population of a certain town (as obtained from census data) is shown in the following table: **(06)**

Year	1921	1931	1941	1951	1961
Population in (in thousands)	19.96	39.65	58.81	77.21	94.61

Estimate the population in the year 1936 and 1963

OR

Q.3 (B) The ordinates of the normal curve are given by the following table. **(06)**

x	0.0	0.2	0.4	0.6	0.8
y	0.3989	0.3910	0.3683	0.332	0.2897

Evaluate

i. y (0.25) by Newton's forward difference
ii. y (0.62) by Newton's backward difference

iii. $y(0.25)$ by Stirling's central difference

Q.4 (A) Find the best fit values of "a" and "b" so that $y = a + bx$ fits the data given in the table **(06)**

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

Q.4 (B) Find the second degree parabola from the following table **(06)**

x	1929	1930	1931	1932	1933	1934	1935	1936	1937
y	352	356	357	358	360	361	361	360	359

OR

Q.4 (B) Find the curve of best fit of the type $y = ae^{bx}$ to the following data by method of least squares: **(06)**

x	1	5	7	9	12
y	10	15	12	15	21

Q.5 (A) Solve $\frac{dy}{dx} = x + y$, by Taylor' series method numerically given at $x = 1, y = 0$, find value up to $x = 1.2$ with $h = 0.1$. **(06)**

Q.5 (B) Use Taylor's series method to obtain the numerical solution of

$\frac{dy}{dx} = x^2 + y^2$ with $x = 1, y = 0$ at $x = 1.3$. **(06)**

OR

Q.5 (B) Evaluate $\int_{-1.6}^{-1} e^x \, dx$, by simpson's one third rule with six sub intervals **(06)**

Q.6 (A) If $\frac{dy}{dx} = x + y^2$, use fourth order Runge Kutta method to find an approximate value of y for $x = 0.2$ given that $y = 1$ when $x = 0$. **(06)**

Q.6 (B)Solve $\frac{dy}{dx} = y^2 - \frac{y}{x}$ with the help of Euler's method provided that $y(1) = 1$ and obtain the value of y(1.6). **(06)**

OR

Q.6 (B). Use Milne's method to obtain the solution of the equation $\frac{dy}{dx} = x - y^2$ at x=0.8 given that **(06)**

x	0	0.2	0.4	0.6
y	0	0.002	0.0795	0.1762