

**B.TechIII Semester (Odd Semester)****Major Examination-2015-2016****Subject Name: Applied Computational Methods****Time: 3 hrs. Max. Marks:40****Note: Attempt all questions. Each question carries equal marks.****Q. 1** Attempt any three of the following. Q. 1(a) is compulsory.

- (a) Find the root of  $f(x) = e^{-x} - x = 0$ , correct to 2 decimal places, by the bisection method. (4)
- (b) Using Newton-Raphson method, find the iterative scheme to compute the inverse of a positive number  $N$ . Hence evaluate the inverse of 18 correct to three decimal places. Take initial guess is as 0.05. (3)
- (c) Using Regula Falsi method, find the root of the equation  $x^3 + x^2 - 3x - 3 = 0$ . (3)
- (d) Solve the following system of linear equation by using Guass-Seidel method,  
 $x + y + 4z = 9$ ,  $8x - 3y + 2z = 20$ ,  $4x + 11y - z = 33$ . (3)

**Q. 2** Attempt any three of the following. Q. 2(a) is compulsory.

- (a) The velocity,  $v$  (metres per second) of a car, which starts from rests, is given at fixed interval of time  $t$  (second) as follows

$t$ :	0	12	24	36	48	60	72	84	96	108	120
$v$ :	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

Using Simpson's  $\left(\frac{1}{3}\right)^{rd}$  rule, find the distance travelled by the car in 2 minutes. (4)

- (b) Find the missing values in the following table

$x$ :	45	50	55	60	65
$y$ :	3.0	—	2.0	—	-2.4

- (c) From the following table, estimate the number of students who has obtained marks between 40 and 45. (3)

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

- (d) Using Lagrange's formula, express the function  $\frac{3x^2+x+1}{(x-1)(x-2)(x-3)}$  as a sum of partial fraction. (3)

**Q. 3.** Attempt any three of the following. Q. 3(a) is compulsory.

- (a) Compute  $y(0.4)$ , from the initial value problem  $\frac{dy}{dx} = -2xy^2$ ,  $y(0) = 1$  with step length  $h = 0.2$ , by the fourth order Runge-Kutta method. Compare the result with exact solution. (4)
- (b) Use Euler's modified method to solve following initial value problem for  $x = 0.02$ ,  
 $\frac{dy}{dx} = x^2 + y$ ,  $y = 1$ , when  $x = 0$ . Take step length  $h = 0.01$ . (3)

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- (c) Solve the following difference equation  $y_{n+2} - 2y_{n+1} + y_n = n^2 \cdot 2^n$ . (3)
- (d) Use Taylor's series method to solve the equation  $\frac{dy}{dx} = -xy, \quad y(0) = 1$ . (3)

Q.4 Attempt any three of the following. Q. 4(a) is compulsory.

- (a) Calculate the median from the following table

Class Interval	0-20	20-40	40-60	60-80	80-100
Frequency	2	7	10	3	3

(4)

- (b) In a certain factory producing cycle tyres, there is a small chance of 1 in 500 tyres to be defective. The tyres are supplied in lots of 10. Using Poisson distribution, calculate the approximate number of lots containing no defective, one defective, two defective tyres respectively in a consignment of 10000 lots. (3)

- (c) Obtain the line of regression of  $y$  on  $x$  for the data given below:

$x$ :	1	3	5	7	9
$y$ :	15	18	21	23	22

(3)

- (d) Assume that 50% of the engineering students are good in mathematics. Determine the probability that among 18 engineering students

(i) Exactly 10                      (ii) at least 2                      (iii) at most 9  
are good in mathematics. (3)