

11/05/2015

VC-D

SYBSc Sem-IV Mathematics-III Marks 75 2:30hrs 122

Note: - 1) All questions are compulsory.

2) Figures to right indicate full marks to corresponding sub-question.

Q. 1) A) i) Derive the basic formula to find area of region as a limit of Riemann sum. (4)

ii) Find area of region enclosed by parabola  $y = 2 - x^2$  and line  $y = -x$ . (4)

OR

A) i) Derive formula to find volume of solid by slicing method. (4)

ii) Find the volume of solid generated by revolving the region bounded by  $y = \sqrt{x}$  and the lines  $y=1$ ,  $x=4$  about the line  $y=1$  (4)

Q.1) B) Attempt any three of the following.

i) Find the length of curve  $y = \frac{4\sqrt{2}}{3}x^{\frac{3}{2}} - 1$ ,  $0 \leq x \leq 1$ . (4)

ii) A pyramid 3 m high has a square base that is 3 m on a side. The cross section of a (4)

Pyramid perpendicular to the altitude  $x$  m down from the vertex is a square  $x$  m on a side. Find the volume of the pyramid.iii) Investigate convergence of  $\int_1^{\infty} e^{-x^2} dx$ . (4)iv) Define improper integral and evaluate  $\int_2^{\infty} \frac{x+3}{(x-1)(x^2+1)} dx$ . (4)

Q. 2) A) Derive Bisection method. Also discuss convergence of Bisection method. (8)

OR

A) Derive Newton Raphson formula using Taylor series. Also write an algorithm for two linear equations Newton Raphson method. (8)

Q.2) B) Attempt any three of the following.

i) Solve the system  $2x_1 + 2x_2 + 3x_3 = 4$ ,  $4x_1 - 2x_2 + x_3 = 9$ ,  $x_1 + 5x_2 + 4x_3 = 3$  using LU (4)  
Decomposition method.ii) Solve the Leonardo equation  $f(x) = x^3 + 2x^2 + 10x - 20 = 0$  by Muller's method. (4)iii) Evaluate the square root of 5 using the equation  $x^2 - 5 = 0$  by applying fixed iteration (4)  
method.iv) Use secant method to estimate root of the equation  $f(x) = x^3 - 5x - 7$  with initial (4)  
estimate of  $x_1 = 2.5$  and  $x_2 = 3$ .



Q. 3) A) Discuss the Milne-Simpson Method and also the accuracy of multi-step method using it. (8)

OR

A) Derive Euler's method and using it solve  $y' = 3x^2 + 1$  with  $y(1) = 2$  to find  $y(1.5)$  (8)  
with  $h=0.25$ .

Q.3) B) Attempt any three of the following.

i) Use Classic Range Kutta method to estimate  $y(1.2)$  when  $y' = x^2 + y^2$  with  $y(1) = 1.5$ . Assume  $h=0.1$  (4)

ii) Estimate  $y(2)$  with  $h=0.5$  for  $y'(x) = \frac{2y}{3}$  with  $y(1) = 2$  using Polygon method. (4)

iii) Given the equation  $y'(x) = 2xy$  with  $y(1) = 2$ . Estimate  $y(1.75)$  using Heun's method for  $h=0.25$  (4)

iv) Use Taylor's method to solve the equation  $y' = x^2$ ,  $y(0) = 1$  for the interval  $(0,0.2)$  using two sub intervals of size 0.1 (4)

Q. 4) A) Attempt any three of the following

i) Solve the following equation by Picard's method to solve  $y'(x) = \frac{x^2}{1+y^2}$ ,  $y(0) = 0$  (5)  
and estimate  $y(0.5)$ .

ii) Discuss accuracy of Multi-step method using -Bashforth-Moulton's method. (5)

iii) Factorise the matrix using Chole sky method. (5)

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$$

iv) Find the root of the equation  $f(x) = x^4 - x - 10$  with initial with  $x = 2$  using Newton Raphson method. (5)

v) State direct comparison test and check convergence of  $\int_1^{\infty} \frac{3}{e^x + 5} dx$ . (5)

vi) Find area under curve  $y = \frac{1}{\sqrt{x}}$  from  $x=0$  to  $x=1$ . (5)