

09/03/15

SYBSC sem IV
Maths - III

VCD --

- MATHS III- SYBSC - SEM IV EXAM - 75 MARKS - 2.5HRS -160

Note:: 1) All questions are compulsory.

2) For Q.1, Q.2, Q.3, attempt any one subquestion (each 8 mks) from part (a), and any three subquestions (each 4 mks) from part(b)

3) For Q.4 Attempt any three.(each 5 mks)

Q.1 (a) Attempt any one

[Each 8]

1) Derive basic formula to find the area of region as a limit of Riemann sum and find the area of region between $x = y + 2$, $x = y^2$ but in first quadrant.

2) Explain the method to find volume of a solid of revolution by disk and washer and solve following

The region between $y = \sqrt{x}$, $0 \leq x \leq 4$ and x-axis is revolved about x-axis. to generate a solid. Find its volume.

Q. 1 (b) Attempt any three.

[Each 4]

1) State Direct comparison test and investigate convergence of $\int_1^{\infty} \frac{\sin^2 x}{x^2} dx$

2) The region is bounded by parabola $y = x^2$ and the line $y = 2x$ in the first quadrant is revolved about y-axis to generate a solid. Find a volume of solid.

3) Find the area under curve $y = \frac{1}{\sqrt{x}}$ from $x = 0$ to $x = 1$

4) Evaluate $\int_2^{\infty} \frac{x+3}{(x-1)(x^2+1)}$

Q.2 (a) Attempt any one

[Each 8]

1) Derive Bisection method and write an algorithm of bisection method

2) Discuss convergence and algorithm of Newton Raphson method

Q. 2 (b) Attempt any three.

[Each 4]

1) Factorise the following matrix using Cholesky's method

$$\begin{bmatrix} 4 & 10 & 8 \\ 10 & 26 & 26 \\ 8 & 26 & 61 \end{bmatrix}$$

2) solve the following

$$2x_1 + 2x_2 + 3x_3 = 4$$

$$4x_1 - 2x_2 + x_3 = 9$$

$$x_1 + 5x_2 + 4x_3 = 3$$

Using LU Decomposition method.

3) Write an algorithm for Cholesky Factorisation

4) Write an algorithm for Muller Method

Q.3 (a) Attempt any one [Each 8]

1) Derive Taylor's formula and solve $y' = x^2 + y^2$ for $x = 0.25$ with $y(0) = 1$

2) Given the equation $\frac{dy}{dx} = \frac{2y}{x}$ with $y(1) = 2$.

Estimate $y(2)$ by Euler's method using $h = 0.25$

Q.3 (b) Attempt any three. [Each 4]

1) Use Classical Runge Kutta method to estimate $y(0.2)$ when $y' = y - x$ with $y(0) = 2$. Assume $h = 0.1$

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

3) Derive Euler Method.

4) Discuss Milne-Simpson's Method.

Q.4 Attempt any three. [Each 5]

1) Derive the formula to find the length of the curve.

2) Define an improper integral and investigate the convergence of $\int_0^1 \frac{1}{1-x} dx$

3) Use Secant method to estimate the root of the equation $x^3 - 5x - 7 = 0$ with initial values $x_1 = 2.5$, $x_2 = 3$

4) Solve Leonardo equation $f(x) = x^3 + 2x^2 + 10x - 20 = 0$ by Muller's Method

5) Discuss Accuracy of Multistep methods using Milne-Sampson's method.

6) Solve by Picard's method

$y'(x) = x^2 + y^2$ with $y(0) = 0$. Estimate $y(1)$.