

SYIT - Applied Math

Seat Number: - _____

Duration: 2 ½ hrs

735031123

Marks:- 75

Note:- 1) All questions are compulsory.

2) Figures to the right indicate maximum marks.

Q1) Attempt any 'Three of the following' (15M)

1) Find the inverse of a matrix using adjust method. (CO1-A)

$$A = \begin{bmatrix} 1 & 2 & -2 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$$

2) Find the inverse of the matrix given using elementary transformation(CO1-A)

$$A = \begin{bmatrix} 1 & 0 & 1 \\ -4 & 1 & -1 \\ 6 & -2 & 1 \end{bmatrix}$$

3) Find the rank of matrix, A by using the row echelon form. (CO1-A)

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$$

4) Solve the system of equations, $x + y + 3z = 0$; $x - y + z = 0$;
 $-x + 2y = 0$; $x - y + 2z = 0$. (CO1-R)

5) Express in the form of $a + ib$ of $\frac{2-\sqrt{3}i}{1+i}$ (CO1-R)

6) If $Z_1=2+4i$ and $Z_2 = 7-5i$ then find $Z_1 - Z_2$ and Z_1+Z_2 (CO1-U)

Q2) Attempt any 'three' of the following (15M)

1) Solve $y^2 - x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ (CO2-A)

2) Solve $(3x + 2x^3)dx + (3x + y - 1)dy = 0$ (CO2-A)

3) Solve $\sec^2 x \cdot \tan y \, dx + \sec^2 y \cdot \tan x \, dy = 0$ (CO2-A)

4) Solve $\frac{dy}{dx} = xy + x + y + 1$ (CO2-A)

5) Solve $y = 2px + p^4 x^2$ (CO2-A)

6) Solve $p^2 - py + x = 0$ (CO2-A)

Q3) Attempt any 'three' of the following (15M)

1) Derive and prove Laplace transform of integration (CO3-R)

2) Find Laplace transform of $f(t) = \left(\frac{\sin 4t}{t}\right)$ (CO3-U)

3) State and derive grail value theorem of Laplace transform (CO3-R)

4) Find Laplace transform of $f(t) = \sin^2 t$ (CO3-U)

5) Write down the prerequisites of error functions (CO3-R)

6) Write down the prerequisites of Gamma functions (CO3-R)

Cont.

Q4) Attempt any 'three of the following' (15M)

1) Evaluate $\int_0^1 \int_0^1 \frac{1}{\sqrt{(1+x^2)(1-y^2)}} dx dy$ (CO4-A)

2) Change the order of integration by showing region of integration and evaluate it.

$\int_0^a \int_{\frac{x}{a}}^{\frac{\sqrt{x}}{a}} (x^2 + y^2) dx dy$ (CO4-A)

3) Evaluate $\iint x^3 dx dy$ over the circle $x^2 + y^2 = 2ax$. (CO4-A)

4) Evaluate $\iiint_V (x + y + z) dx dy dz$ over the tetrahedron bounded by the planes $x = 0, y = 0, z = 0$ and $x+y+z=1$. (CO4-A)

5) Change the order of integrators and evaluate. (CO4-A)

$\int_0^1 \int_{x^2}^x xy dx dy$

6) Evaluate $\iint xy(x + y) dx dy$ over the area between curve $y = x^2$ and the line $y=x$ (CO4-A)

Q5) Attempt any 'three' of the following (15M)

1) Define the Beta and Gamma functions. (CO5-R)

2) Prove that, $\beta(m, n) = \beta(n, m)$ (CO5-R,U)

3) Prove that, $|1| = 1$ (CO5-R,U)

4) Prove that, $|n + 1| = n!$, if n is an integer. (CO5-U)

5) Derive the expression of error function in series. (CO5-R)

6) Evaluate $\int_0^1 x^5 \sin^{-1} x dx$ (CO5-R)

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