FYBSc. IT SEM-I (Old ATKT) 11/02/2020

Time: 2 $^1/_2$ hrs. Applied Maths-I Marks:75

10.00 - 12.30pm.

All questions are compulsory with internal choice.

Figure to the right indicates marks.

Use of calculator is allowed.

Q 1. Attempt any two from the following: [5x2 = 10]

a) If the matrix A is is a skew hermitian matrix. Find iA and comment on your answer, where

A = $\begin{bmatrix} 1 & 1-2i \\ -1-2i & 0 \end{bmatrix}$.

b) Show that inverse of unitary matrices is unitary.

c) Reduce the following matrix to the normal form and also find its rank

$$A = \begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & 3 & 4 \end{bmatrix}$$

d) Find inverse of the following matrix by using adjoint method

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

Q 2. Attempt any two from the following: [5x2 = 10]

a) Check whether the vectors (2, 1, 4) , (0, 7, 3) and (2, 1, 6) are linearly dependent. If so, find the relation between them.

b) Find the solution of the following system of equation:

4x - 2y + 6z = 8, x + y – 3z = -1, 15x - 3y + 9z = 21.

c) Find an inner product a.b and b.a where a = 3i – 8j + 2k, b = i + 7j – 2k.

d) Find the eigenvalues of matrix A = $\begin{bmatrix} 8 & 4 \\ 3 & -2 \end{bmatrix}$.

Q 3. Attempt any two from the following: [5x2 = 10]

a) The position vector of a moving particle at a time t is $R = t^2 i - t^3 j + t^4 k$. Find the tangential and normal components of its acceleration at t = 1.

b) A particle moves on the curve x = 2 t^2 , y = t^2 – 4t , z = 3t – 5, where t is the time. Find the velocity and acceleration at time t = 1.

c) Find a unit vector normal to the surface$x^3 + y^3 + 3xyz = 3$ at the point (1, 2, -1) .

d) Find the volume of the parallelepiped whose edges are represented by the vectors A = - i + 2j – 4k , B = -2i + 5j + k , C = 3i + j + 2k.

Q 4. Attempt any two from the following: [5x2 = 10]

a) Solve $\frac{dy}{dx}$ =e^{2x-y}.

b) Solve $(e^y + 1)\cos x$ dx + $e^y \sin x$ dy = 0.

c) Solve (2x^3 + 3y) dx + (3x + y – 1) dy = 0

d) Solve $\frac{dy}{dx}$ = y.

Q 5. Attempt any two from the following: **[5x2 = 10]**

a) If $y = ax + b\sqrt{x}$ then prove that $2x^2y_2 - xy_1 + y = 0$.

b) Solve $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4y = 0$.

c) Solve $(D^2 + 2D + 3)y = x - x^2$.

d) Solve $(D^2 + 4D + 4)\ y = x^2$.

Q 6. Attempt any two from the following: **[5x2 = 10]**

a) Verify Cauchy MVT for $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{\sqrt{x}}$, in [a, b].

b) Verify Roll's theorem for the function $f(x) = (x^2 - 1)(x - 2)$ in [-1,2].

c) Verify LMVT for f(x) = (x – 1)(x – 2)(x – 3) in [0, 4].

d) Verify Cauchy MVT for $f(x) = x^2$ and g(x) = x in [a, b].

Q 7. Attempt any three from the following: **[5x3 = 15]**

a) Find the eigen values of the matrix $A = \begin{bmatrix} -2 & 3 \\ 5 & -2 \end{bmatrix}$.

b) Solve $\log\left(\frac{dy}{dx}\right) = ax + by$.

c) If R = A sin ωt + B cos ωt, where A, B are constant vectors and ω is a scalar then show that $R \times \frac{dR}{dt} = -\omega(A \times B)$.

d) Solve (2x- y+1) dx + (2y – x – 1) dy = 0.

e) Verify LMVT for $f(x) = 2x^2 - 7x + 10$ in [2, 0].

f) Evaluate curl $[e^{xyz}(I + J + K)]$.

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