



Daffodil International University

Department of Computer Science & Engineering

Faculty of Science and Information Technology

Final Examination, Semester: Fall' 2017

Course Code: MAT 121

Course Title: Mathematics-II

Section: ALL

Course Teacher: ALL

Time: 2 Hours

Full Marks: 40

Answer any 4 Questions from the following Questions

Question no. 1 (any 10)

1×10

- If $A = \begin{pmatrix} 7 & 0 & -1 & 4 \\ 2 & & & \end{pmatrix}$, then find the RREF of A.
- $T: \mathbb{R}^8 \rightarrow \mathbb{R}^5$ is a linear transformation. $T(0,0,0,0,0,0,0,0) = ?$
- If $T: \mathbb{R}^{15} \rightarrow \mathbb{R}^{15}$ is a linear transformation then T^{-1} exists: True or False?
- What the range of φ in spherical system?
- If M has an spectrum $\{1, 0, -1, 3, 5\}$ then M^{-1} does not exist: True or False?
- What is the spherical form of the Cartesian equation $x^2 + y^2 + z^2 = 625$?
- M has eigenvalues 1, -1, 2, -3. What is an spectrum of M^4 ?
- How many eigenvalues do belong to a 9×5 matrix?
- Find θ when $(2, -5)$ is converted into polar system.
- What is the angle between 2 straight lines represented by $x^2 - y^2 = 0$?
- What is the standard matrix for the orthogonal projection on Y-axis?
- How many eigenvalues do belong to a 9×9 matrix?

Question no. 2

- Check the followings for linear transformations:
 - $S(a, b, c, d) = (-b, c + 3d, -b + 2a)$
 - $T(p, q, r, s, t) = (s - t, 0, 5q, p + q + rt)$; (iii) $R(x, y) = (x - y, -2x + 3y)$
 - $U(k, l, m) = (k + l + m, l - m - k)$
- Find R^{-1} and U^{-1} if they exist. If it does not exist give reason. Also verify the inverse for a nonzero vector.
- Find $U \circ S$.

Question no. 3

$S = \{(0,0,-7,1), (-1,0,1,1), (-3,-1,0,2), (-1,1,2,1), (6,0,1,0), (-4,1,3,0)\}$

- Check S for linear dependency.
- Find 2 LDRs.
- Describe the 1st and 4th vectors of S with the help of others.

Question no. 4

$$M = \begin{pmatrix} 1 & 2 & -5 \\ -2 & 0 & 1 \\ 4 & -1 & 5 \end{pmatrix}$$

- Find an spectrum of M.
- Find eigenvalues of M^5 , M^{-2}
- Find M^{-1} by using Cayley-Hamilton theorem.

Question no. 5

- $5x^2 - 2x - 4y + 2xy = 0$.
- $2x^2 - 5xy + 3y^2 - 3x + 5y - 2 = 0$.
- $11x^2 - 11y^2 + 5xy - 13y + 2x - 33 = 0$.

- What is represented by each of above equations?
- In case of straight lines, find the angle between the lines.
- In case of straight lines, find the eqn of each line.
- Find the angle of rotation that will eliminate 'xy' (any one).

Question no. 6

(i). Change the followings to the indicated systems:

(a). $(-5, 0, -9) \rightarrow SS$. (b). $(9, 130^0, 327^0) \rightarrow RS$

(ii). If $x^2 + y^2 + z^2 = 5z\sqrt{x^2 + y^2}$. then show that $\tan \varphi + \cot \varphi = 5$.

(iii). $V = (9, -5)$ and T is reflection about the line $y = -x$, then find $T(v)$.

(iv). $w = (5, 10, 63)$ is sheared along Y-axis by factor $\frac{1}{3}$ then find $T(w)$.