DPP-2969

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First Year B. Sc. (Sem. II) Examination

March/April – 2016

Paper - MCS 202 : Mathematics for Computer Science

(Theory of Matrics)

Time : Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **First Year B. Sc. (Sem. II)**

Name of the Subject :

☛ **MCS 202 : Mathematics for Computer Science**

☛ Subject Code No. : **2 9 6 9** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

Q:1 Answer the following Questions any five: **[10]**

1. Define equal matrices with illustration.

2. If $A=\begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$ and $C=\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ then show that $A^2=B^2$

3. Define Transpose of matrix with illustration.

4. Find A^{-1} for the matrix $A=\begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$

5. Prove that if A and B are non-singular matrices then $A^{-1}B$ and BA^{-1} are similar matrices.

6. If $A=\begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$ then find A^{-1}

7. When does a non-homogeneous system of equations have infinite solution?

Q: 2 (A) For any square matrix A, prove that **[05]**

(i) $A+A^{\theta}$ is Hermitian.

(ii) $A-A^{\theta}$ is Skew Hermitian.

OR

Q: 2 (A) if A and B are $m\times n$ and $AB=BA$ matrices respectively then prove that $(AB)^{T}=B^{T}A^{T}$ **[05]**

Q: 2 (B) Attempt Any two **[10]**

(1) Prove that any square matrix A can be uniquely expressed as $P+iQ$ where both P and Q are Hermitian matrices.

(2) If $A=\begin{bmatrix}1 & 3\\ 0 & 2\\ -1 & 4\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2 & 3 & -4\\ 2 & 0 & -2 & 1\end{bmatrix}$ then find $A\bullet B$ also find $B\bullet A$ if possible.

(3) If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, $B=\begin{bmatrix}3 & 1\\ 4 & 2\end{bmatrix}$ and $C=\begin{bmatrix}5 & 1\\ 7 & 4\end{bmatrix}$ than show that

(i) $A(B+C)=AB+AC$ **(ii)** $(A+B)C=AC+BC$

(4) If $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$ then find the value of $A^{2}-4A-5I$

Q: 3 (A) Define a non-singular matrix. Find the inverse of a matrix $A=\begin{bmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{bmatrix}$ by applying Elementary raw operations. **[05]**

OR

Q: 3 (A) Verify that $(A\cdot B)^{T}=B^{T}\cdot A^{T}$ for the following matrices **[05]**

$A=\begin{bmatrix}2 & 5 & 7\\ 2 & -1 & 0\\ 3 & 4 & 8\end{bmatrix}$ and $B=\begin{bmatrix}1 & 4 & 9\\ 3 & -2 & 4\\ 5 & 6 & 8\end{bmatrix}$

Q: 3 (B) Attempt any two: **[10]**

(1) Prove that A is Hermition if and only if $A^{\theta}=A$.

(2) If $A=\begin{bmatrix}3 & 2\\ 4 & 1\end{bmatrix}$ and $B=\begin{bmatrix}a & b\\ 3 & 5\end{bmatrix}$ then find the values of a and b if $AB=BA$

(3) Find the inverse of a matrix $A=\begin{bmatrix}2 & 4 & 5\\ 1 & 3 & 1\\ 1 & 0 & 7\end{bmatrix}$ by applying Elementary raw operations.

(4) If $A=\begin{bmatrix}1&2&3\\0&1&2\\0&0&1\end{bmatrix}, \hat{B}=\begin{bmatrix}X\\Y\\Z\end{bmatrix}$ and $A\cdot B=\begin{bmatrix}6\\3\\1\end{bmatrix}$

Q:4 (A) Express the matrix $A=\begin{bmatrix}0&1&3&-1&3&1\\0&1&3&0&2&3\\0&2&6&1&3&9\\0&4&12&-2&10&7\end{bmatrix}$ in the raw reduced Echelon form **[05]**

OR

Q:4 (A) Find rank of the matrix $A=\begin{bmatrix}1&0&1&0\\2&1&1&1\\0&1&0&1\end{bmatrix}$ **[05]**

Q: 4(B) Attempt Any two **[10]**

(1) Find rank of the matrix $A=\begin{bmatrix}1&2&3\\2&3&4\\4&10&18\end{bmatrix}$

(2) Find the inverse of a matrix $A=\begin{bmatrix}2&-1&4\\-3&0&1\\-1&1&2\end{bmatrix}$ by applying Elementary raw operations.

(3) Find rank of the matrix $A=\begin{bmatrix}1&2&1&2\\3&2&3&2\\-1&-3&0&4\\0&4&-1&-3\end{bmatrix}$

(4) Express the matrix $A=\begin{bmatrix}1&-2&1&0\\-2&4&1&3\\0&0&1&1\\3&-6&2&-1\end{bmatrix}$ in the raw reduced Echelon form

Q:5(A) For what values of λ and μ, given non-homogeneous system of equations has **[05]**

(1) no solution (2) unique solution?

$$\begin{bmatrix}1&1&1\\1&2&3\\1&2&\lambda\end{bmatrix}\begin{bmatrix}X\\Y\\Z\end{bmatrix}=\begin{bmatrix}6\\10\\\mu\end{bmatrix}$$

OR

Q: 5(A) Prove that the following system of equations has many solutions and solve it. **[05]**

$$3X+Y+Z=2$$
$$X-3Y+2Z=1$$
$$7X-Y+4Z=5$$

Q: 5(B) Solve Any TWO of the following system of equations: [10]

(1)
$$X+2Y+3Z=0$$
$$3X+4Y+4Z=0$$
$$7X-10Y+12Z=0$$

(2)
$$X+2Y-Z=3$$
$$3X-Y+4Z=1$$
$$2X-2Y+3Z=4$$
$$X-Y+Z=-1$$

(3)
$$X+Y+3Z=0$$
$$X-Y+Z=0$$
$$X-2Y=0$$

(4)
$$X+Y+Z=9$$
$$2X+5Y+7Z=52$$
$$2X+Y-Z=0$$