

- A. ✖ For all  $i, j$  with  $i \neq j$ ,  $S[i][j] + S[j][i] = 1$
- B. ✖ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 0$  then  $S[j][i] = 1$
- C. ✔ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 1$  then  $S[j][i] = 1$
- D. ✖ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 1$  then  $S[j][i] = 0$
- E. ✔ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 0$  then  $S[j][i] = 0$

**Question Number : 232 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

There will be an edge between bills  $i$  and  $j$  if:

It is a Multiple Select Question (MSQ).

**Options :**

- A. ✔ The total bill amount of  $i$  is lower than the total bill amount of  $j$  by less than 100 and both bills are from the same shop.
- B. ✔ The total bill amount of  $i$  is greater than the total bill amount of  $j$  by less than 100 and both bills are from the same shop.
- C. ✖ The total bill amounts of bills  $i$  and  $j$  are same but both bills are from the different shops.
- D. ✔ The total bill amounts of bills  $i$  and  $j$  are same and both bills are from the same shop.

## Sem2 Maths2

**Number of Questions :** 6

**Section Marks :** 50

**Question Number : 233 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "SEMESTER 2: MATHEMATICS FOR DATA SCIENCE 2"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

**Options :**

A. ✓ YES

B. ✗ NO

**Question Type : COMPREHENSION**

**Question Numbers : (234 to 235)**

Question Label : Comprehension

Let  $A$  be a  $3 \times 2$  non-zero real matrix.

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 234 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

The minimum value of  $\text{rank}(A)$  is \_\_\_\_\_.

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 235 **Question Type :** SA

**Correct Marks :** 2

Question Label : Short Answer Question

The maximum value of *nullity*(A) is \_\_\_\_\_.

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 236 **Question Type :** MSQ

**Correct Marks :** 8

Question Label : Multiple Select Question

An inner product on a vector space  $V$  is a function  $\langle \cdot, \cdot \rangle : V \times V \rightarrow \mathbb{R}$  satisfying the following conditions:

Condition 1:  $\langle v, v \rangle > 0$  for all  $v \in V \setminus \{0\}$ ;  $\langle v, v \rangle = 0$  if and only if  $v = 0$ .

Condition 2:  $\langle v_1 + v_2, v_3 \rangle = \langle v_1, v_3 \rangle + \langle v_2, v_3 \rangle$ .

Condition 3:  $\langle v_1, v_2 \rangle = \langle v_2, v_1 \rangle$ .

Condition 4:  $\langle cv_1, v_2 \rangle = c\langle v_1, v_2 \rangle$

Define  $V = \mathbb{R}^2$  and the function defined as:

$$\begin{aligned}\langle \cdot, \cdot \rangle : V \times V &\rightarrow \mathbb{R} \\ \langle (x_1, y_1), (x_2, y_2) \rangle &= 2x_1x_2 + 3y_1y_2.\end{aligned}$$

Which of the above conditions are satisfied for the above function?

**Options :**

- A. ✓ Condition 1.
- B. ✓ Condition 2.
- C. ✓ Condition 3.
- D. ✓ Condition 4.

**Question Number : 237 Question Type : MSQ**

**Correct Marks : 10**

Question Label : Multiple Select Question

Consider the following set  $S = \{(1, 1, 1), (-2, 1, 1), (0, 1, -1)\}$ . Which of the following options are true for  $S$ ?

**Options :**

- A. ✓ The cardinality of  $S$  is equal to the number of elements in any basis of  $\mathbb{R}^3$ .
- B. ✓  $S$  is a linearly independent set.
- C. ✓  $S$  spans  $\mathbb{R}^3$  (with respect to usual addition and scalar multiplication).
- D. ✓  $S$  is a basis of  $\mathbb{R}^3$  (with respect to usual addition and scalar multiplication).

E. ✓  $S$  is an orthogonal set with respect to usual inner product, i.e. dot product on  $\mathbb{R}^3$ .

F. ✗  $S$  is an orthonormal set with respect to usual inner product, i.e. dot product on  $\mathbb{R}^3$ .

### Question Type : COMPREHENSION

#### Question Numbers : (238 to 241)

Question Label : Comprehension

Determine whether the statements given in the subquestions are true or false.

#### Sub questions

#### Question Number : 238 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question

If  $A$  or  $B$  is invertible, then  $AB$  and  $BA$  are similar matrices (i.e.,  $AB$  is similar to  $BA$ ).

Options :

A. ✓ TRUE

B. ✗ FALSE

#### Question Number : 239 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Any two scalar matrices are similar.

Options :

A. ✗ TRUE

B. ✓ FALSE

**Question Number : 240 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

If  $A$  is similar to  $B$ , then  $A^k$  is similar to  $B^k$ , for any positive integer  $k$ .

**Options :**

A. ✓ TRUE

B. ✗ FALSE

**Question Number : 241 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

If  $A$  and  $B$  are two  $3 \times 3$  matrices, which are similar to each other. Suppose the homogeneous system of linear equations  $Ax = 0$  has a unique solution, then the homogeneous system of linear equations  $Bx = 0$  also has a unique solution.

**Options :**

A. ✓ TRUE

B. ✗ FALSE

**Question Type : COMPREHENSION**

**Question Numbers : (242 to 246)**

Question Label : Comprehension

Anamika, Subhasis and Shreya pool together  $x, y$ , and  $z$  amounts of money (in thousands) respectively, every month. The sum is distributed across three accounts  $A_1, A_2$  and  $A_3$  as  $x + y + z, z - 2y$  and  $2y - z$  respectively. This can be thought of as a linear transformation

$$T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$$

defined by

$$T(x, y, z) = (x + y + z, z - 2y, 2y - z) \quad .$$

**Note:** A negative amount of money signifies the amount withdrawn from the accounts. Answer the subquestions using the information given above.

### Sub questions

**Question Number : 242 Question Type : MCQ**

**Correct Marks : 6**

Question Label : Multiple Choice Question

Which of the following vector spaces consists of vectors which could denote the amount of money deposited by Anamika, Subhasis and Shreya in a particular month such that in that month the amount deposited is 0 in each of the accounts  $A_1, A_2$  and  $A_3$ .

**Options :**

A. ✖  $\text{Span}\{(-3t, t, 0), (0, t, 2t) \mid t \in \mathbb{R}\}$

B. ✔  $\text{Span}\{(-3t, t, 2t) \mid t \in \mathbb{R}\}$

C. ✖  $\text{Span}\{(3t, -t, 2t) \mid t \in \mathbb{R}\}$

D. ✖  $\text{Span}\{(3t, -t, 0), (0, -t, 2t) \mid t \in \mathbb{R}\}$

**Question Number : 243 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Find out  $nullity(T)$ .

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number : 244 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Find out  $rank(T)$ .

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number : 245 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following options is true?



**Options :**

- A. ✖  $T$  is one to one.
- B. ✖  $T$  is onto.
- C. ✖  $T$  is both one to one and onto.
- D. ✔  $T$  is neither one to one nor onto.

**Question Number : 246 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Which of the following matrices is the matrix representation of  $T$  with respect to the ordered basis  $\{(1, 0, 0), (1, 1, 0), (1, 1, 1)\}$  of the domain and standard ordered basis of  $\mathbb{R}^3$  for the co-domain?

**Options :**

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

B. ✖ 
$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & -2 & 1 \\ 0 & 2 & -1 \end{bmatrix}$$

C. ✖ 
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & -2 & 2 \\ 3 & -1 & 1 \end{bmatrix}$$

D. ✔ 
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -2 & -1 \\ 0 & 2 & 1 \end{bmatrix}$$

## Sem2 Stats2

Number of Questions : 12

Section Marks : 50

Question Number : 247 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "SEMESTER 2: STATISTICS FOR DATA SCIENCE 2"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

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(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

A.  Yes

B.  No

Question Number : 248 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question