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| --- |
| GATE |
| Linear Algebra |
| PYS’s and Solution |

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| VARUN KUMAR  7-31-2025 |

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# **CSE**

## 2025

**S1**

**Q.** Consider the given system of linear equations for variables 𝑥 and 𝑦, where 𝑘 is a real-valued constant. Which of the following option(s) is/are CORRECT?

1. There is exactly one value of 𝑘 for which the above system of equations has no solution.
2. There exist an infinite number of values of 𝑘 for which the system of equations has no solution.
3. There exists exactly one value of 𝑘 for which the system of equations has exactly one solution.
4. There exists exactly one value of 𝑘 for which the system of equations has an infinite number of solutions.

ANS: - a, d

**Q.** Let 𝐴 be a 2 × 2 matrix as given.

What are the eigenvalues of the matrix 𝐴13?

1. 1, −1
2. 2√2, −2√2
3. 4√2, −4√2
4. 64√2, −64√2

**ANS: - d**

**S2**

**Q**. If then which ONE of the following is 𝐴8?

a. c.

b. d.

ANS: - c

**Q.** Let 𝐿, 𝑀, and 𝑁 be non-singular matrices of order 3 satisfying the equations

Which ONE of the following is the value of the determinant of (𝑀 − 𝑁)?

1. 0
2. 1
3. 2
4. 3

ANS: - a

**Q.** Consider a system of linear equations 𝑃𝑋 = 𝑄 where and . Suppose 𝑃 has an LU decomposition, 𝑃 = 𝐿𝑈, where

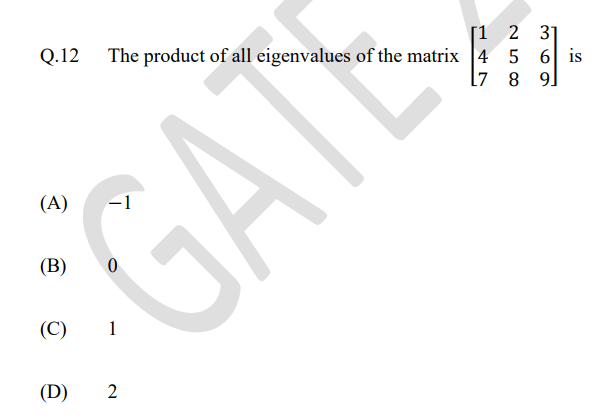
L = and

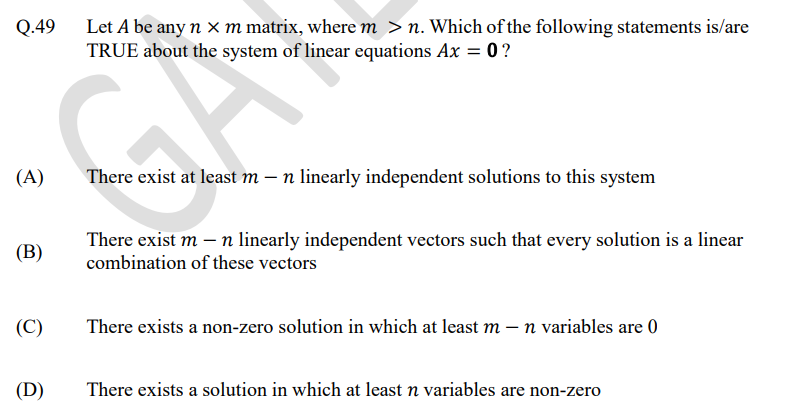
Which of the following statement(s) is/are TRUE?

1. The system 𝑃𝑋 = 𝑄 can be solved by first solving 𝐿𝑌 = 𝑄 and then 𝑈𝑋 = 𝑌.
2. If 𝑃 is invertible, then both 𝐿 and 𝑈 are invertible
3. If 𝑃 is singular, then at least one of the diagonal elements of 𝑈 is zero.
4. If 𝑃 is symmetric, then both 𝐿 and 𝑈 are symmetric.

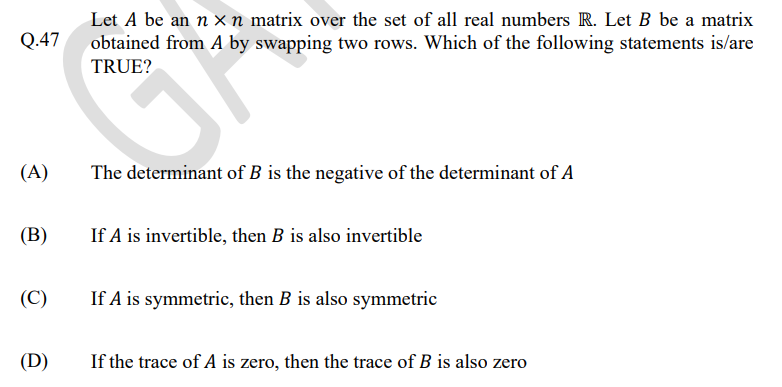
ANS: - a, b, c

## 2024

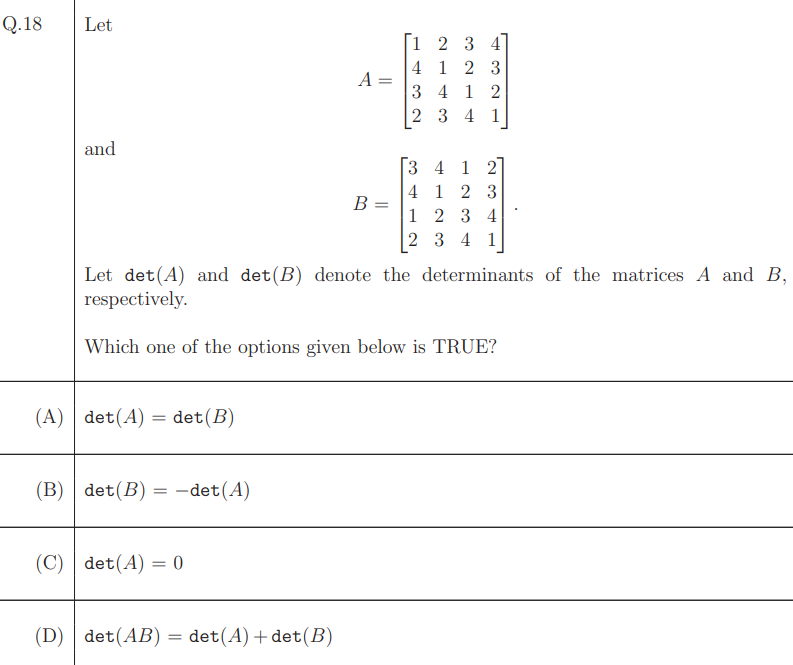


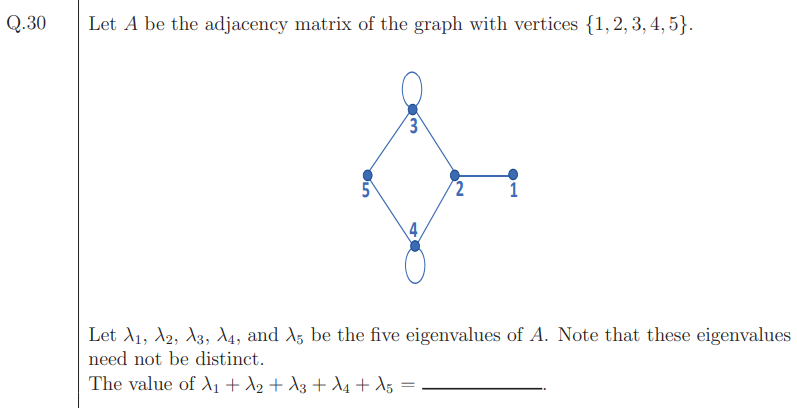


**S2**

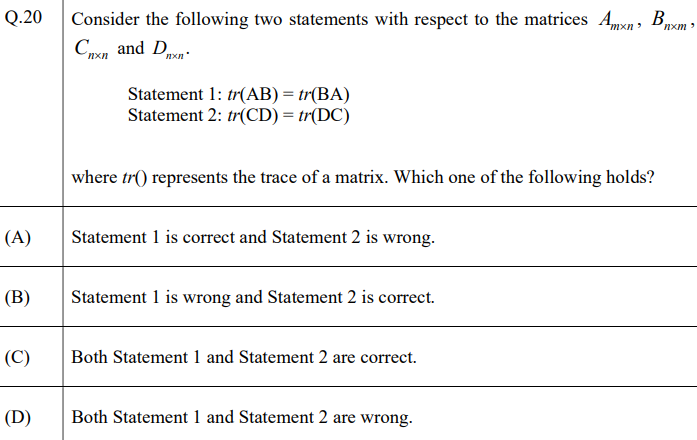


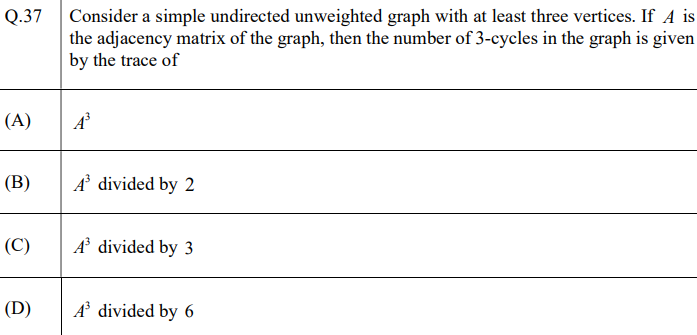
## 2023

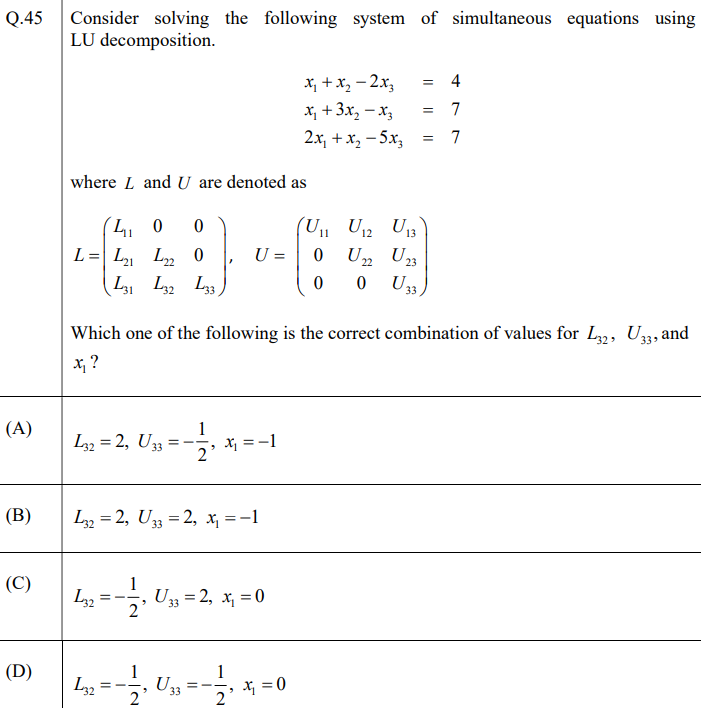


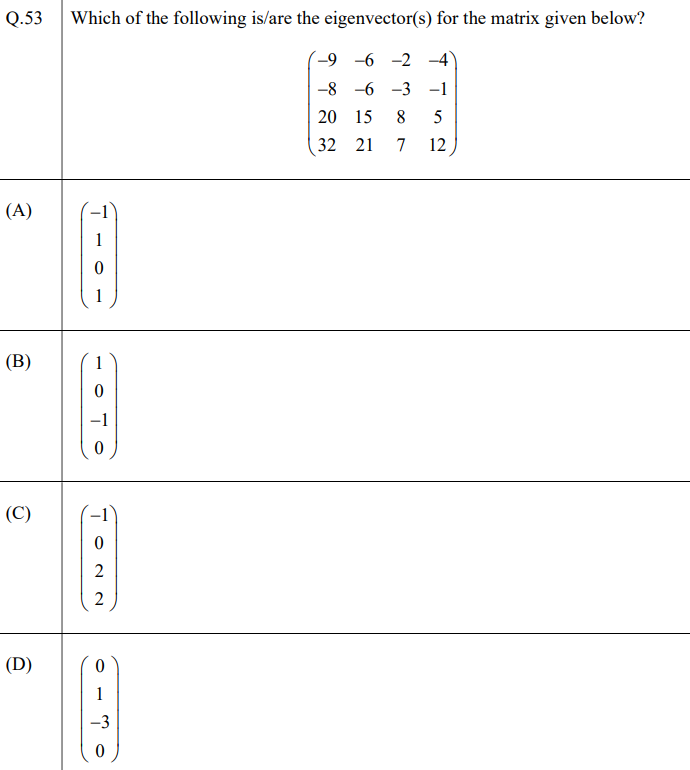


## 2022

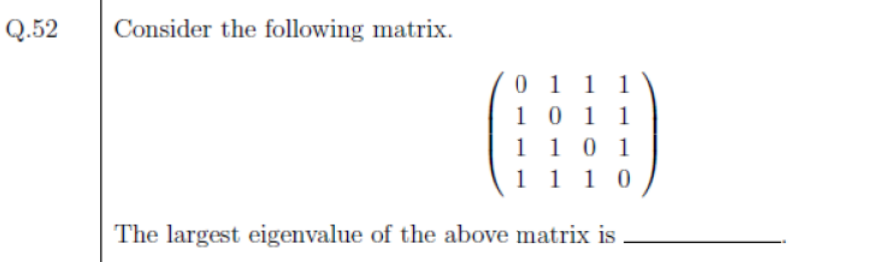








## 2021, S-1



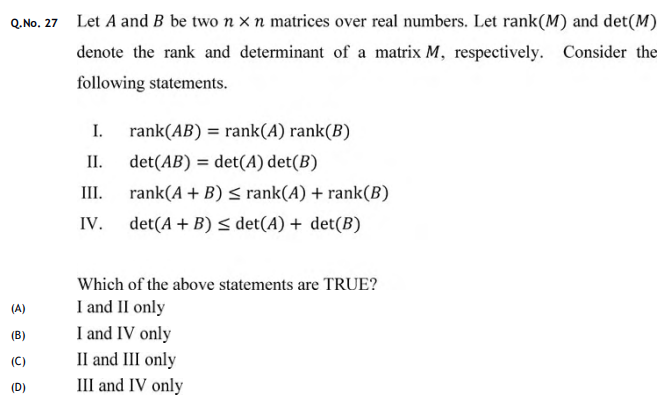
ANS: - 3

## 2021, S-2



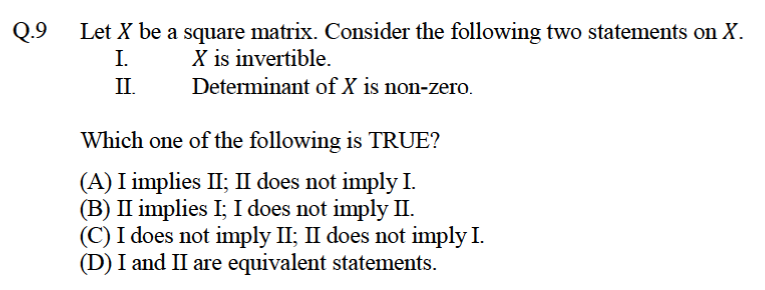
ANS: - 4

## 2020

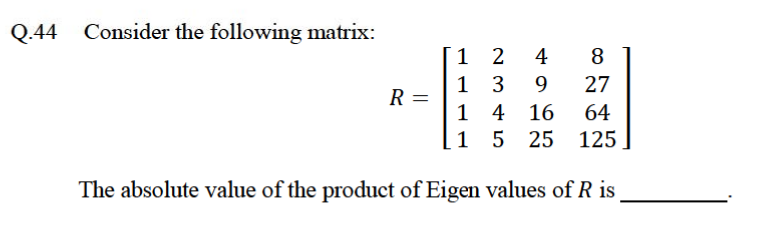


ANS: - C

## 2019

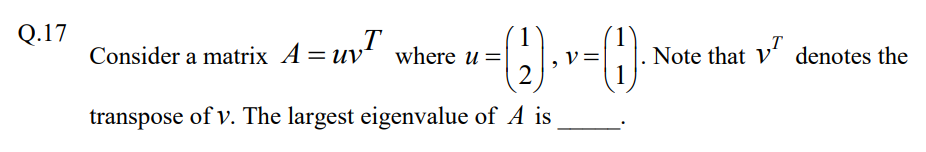


ANS: - D

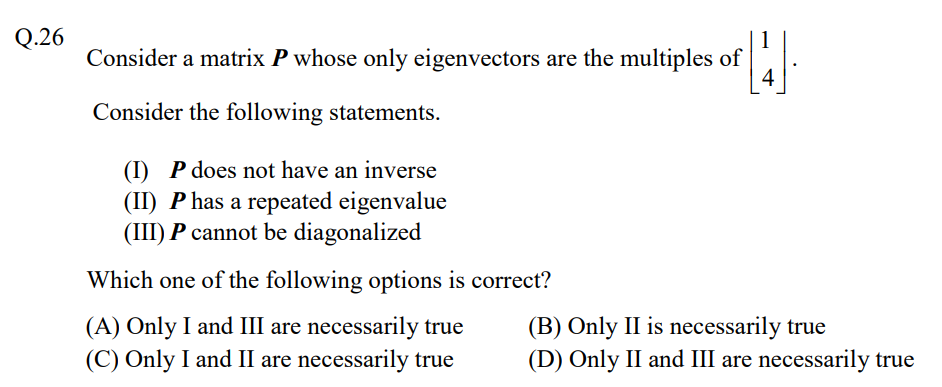


ANS: - 12

## 2018



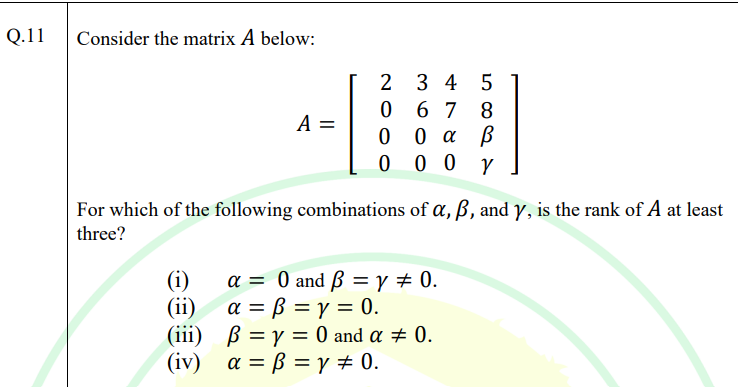
ANS: - 3



ANS: - D

# **ECE**

## 2025



(A) Only (i), (iii), and (iv)

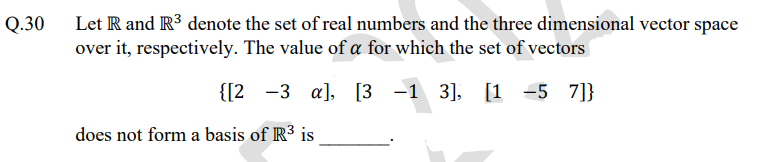
(B) Only (iv)

(C) Only (ii)

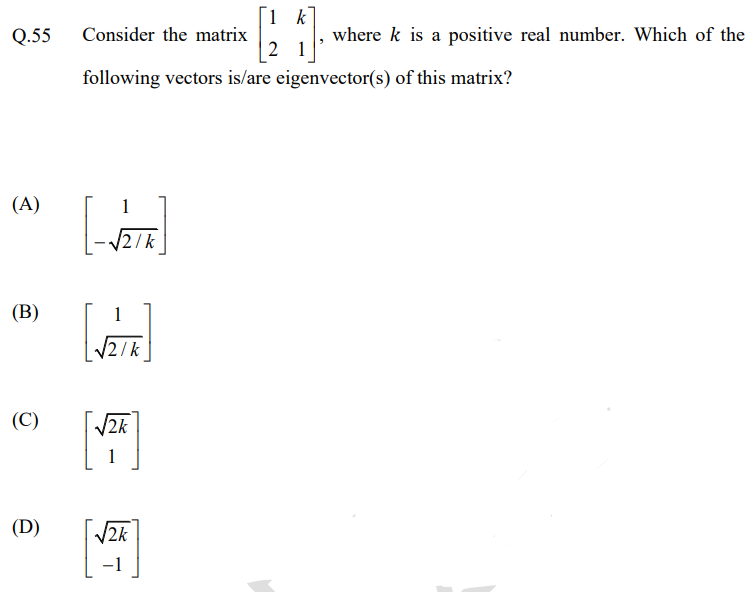
(D) Only (i) and (iii)

ANS: - A

## 2024

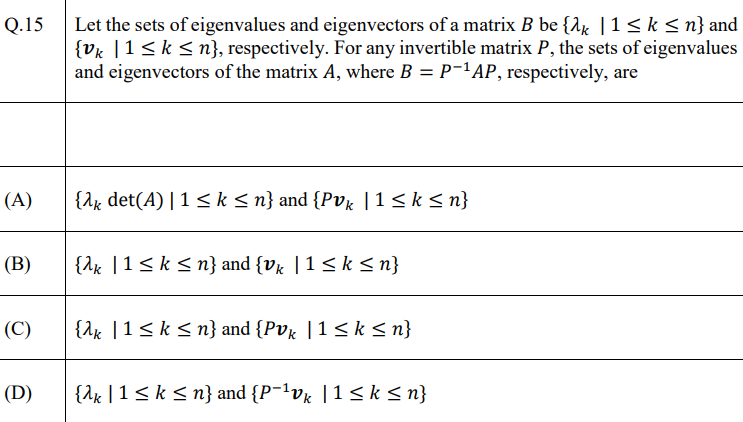


ANS: - 5 (Check the answer)

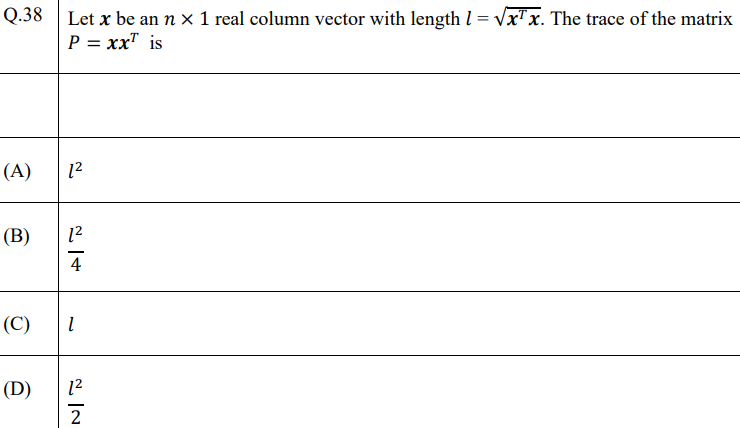


ANS: - A, B (check the answer)

## 2023

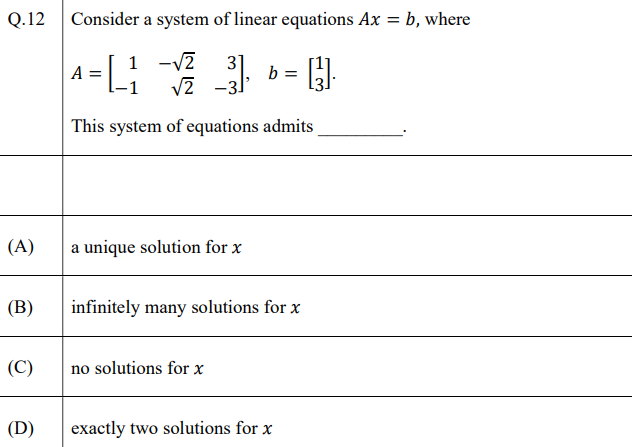


ANS: -



ANS: -

## 2022

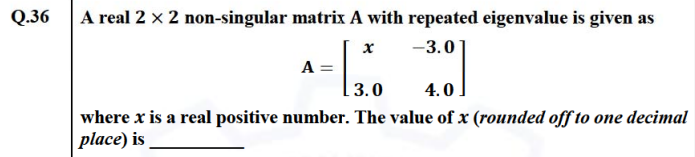


ANS: -

## 2021

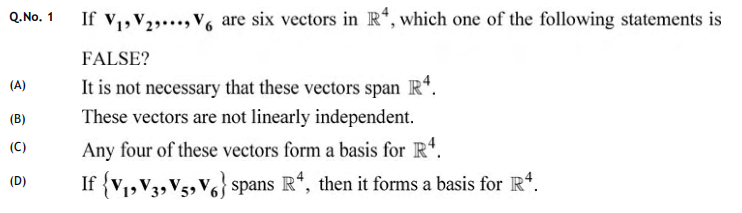


ANS: -

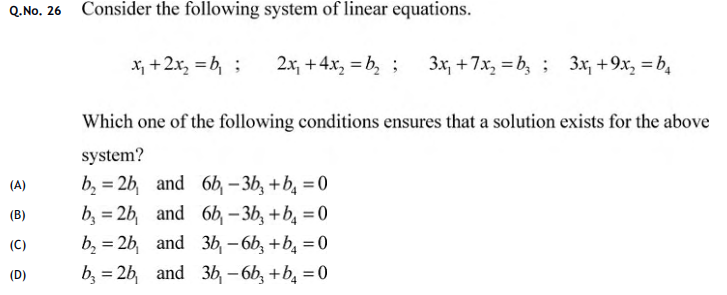


ANS: -

## 2020

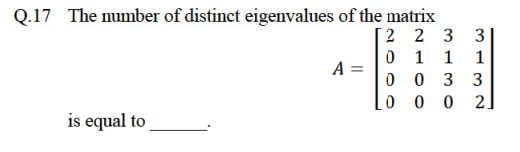


ANS: - C



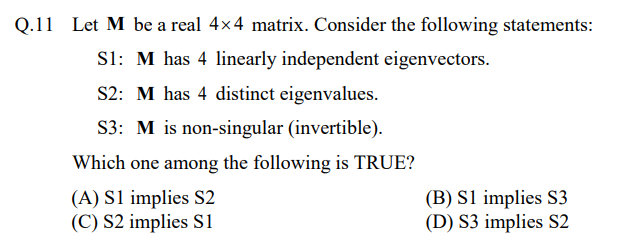
ANS: - A

## 2019

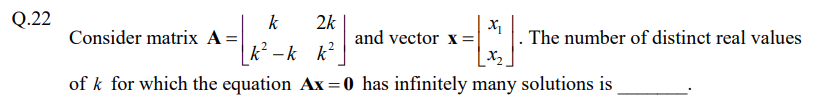


ANS: - 3

## 2018



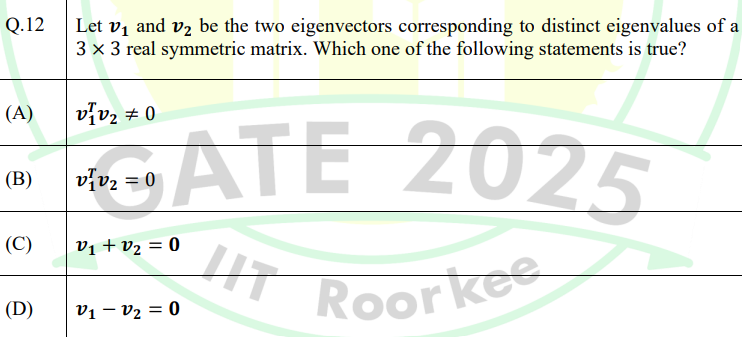
ANS: - C



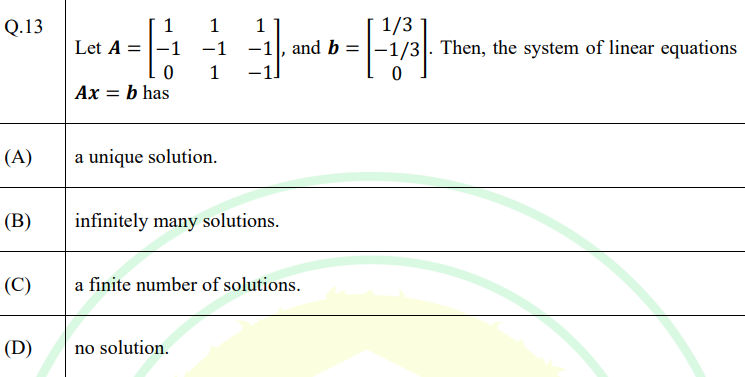
ANS: - 2

# **EEE**

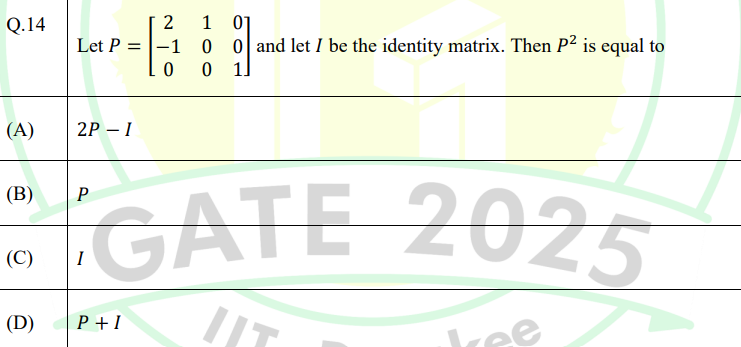
## 2025



ANS: - B

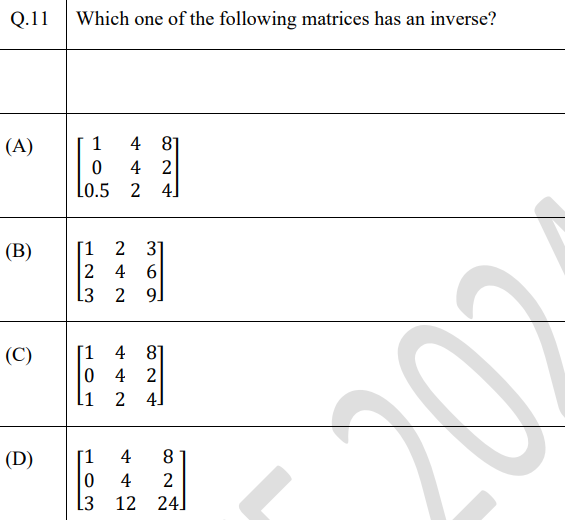


ANS: - B

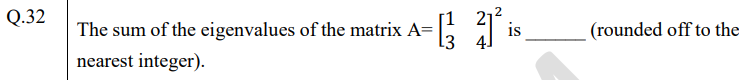


ANS: - A

## 2024

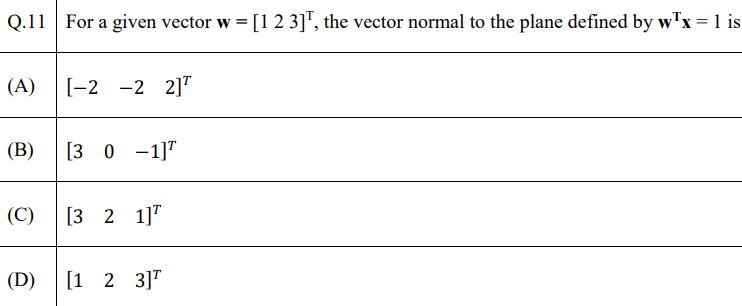


ANS: -



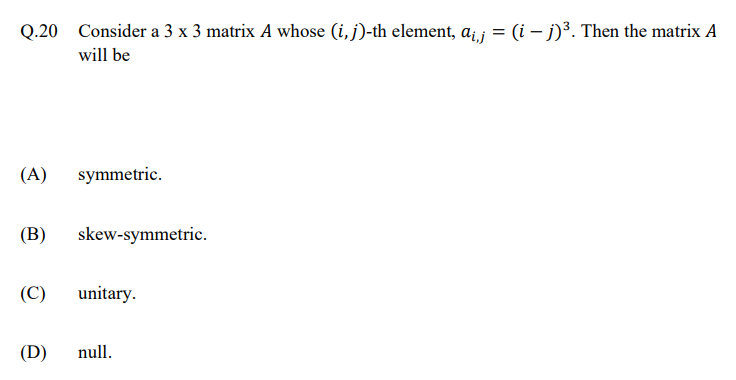
ANS: -

## 2023

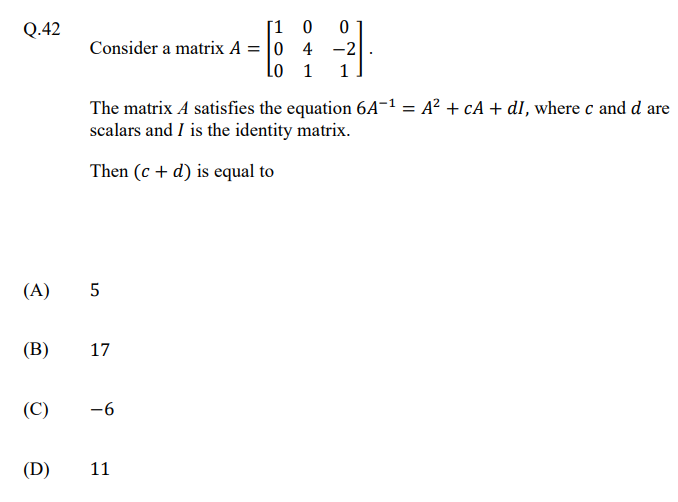


ANS: -

## 2022

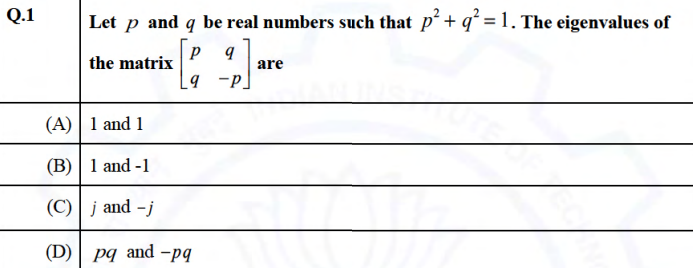


ANS: -

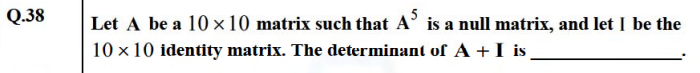


ANS: -

## 2021

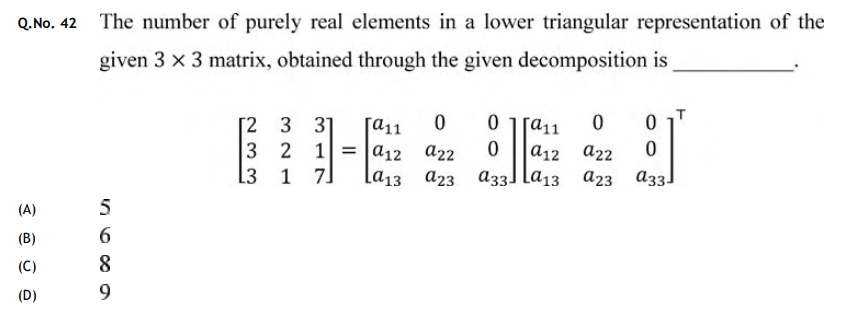


ANS: - B



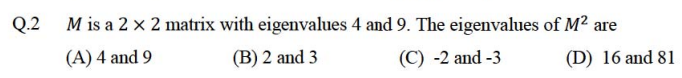
ANS: - 1

## 2020

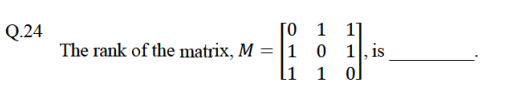


ANS: - MTA

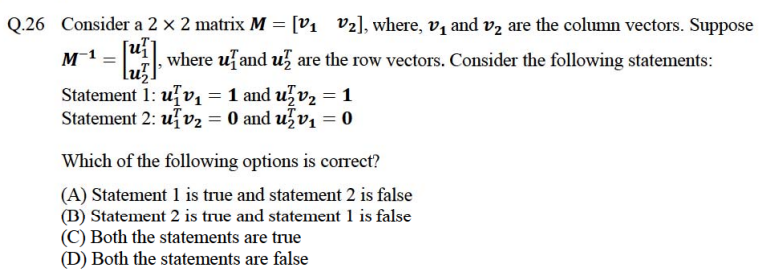
## 2019



ANS: - D

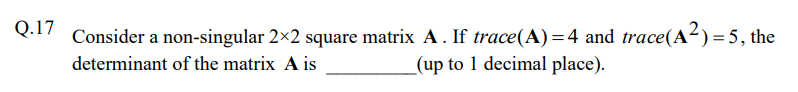


ANS: - 3

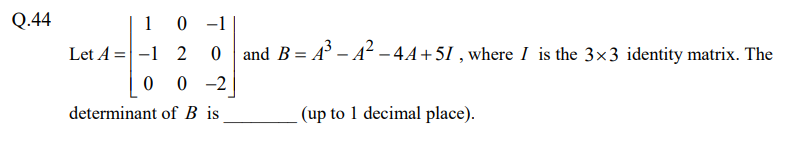


ANS: - C

## 2018



ANS: - 5.5

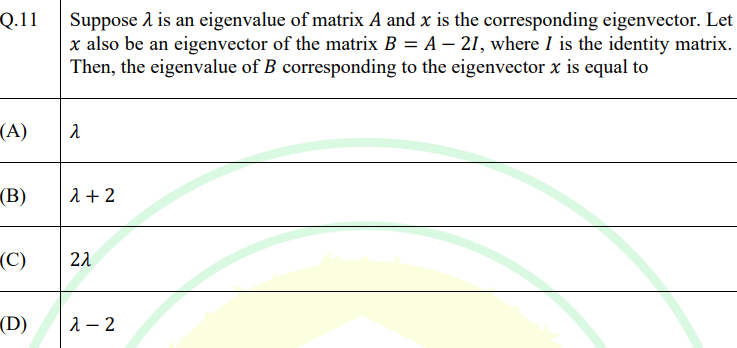


ANS: - 0.9 - 1.1

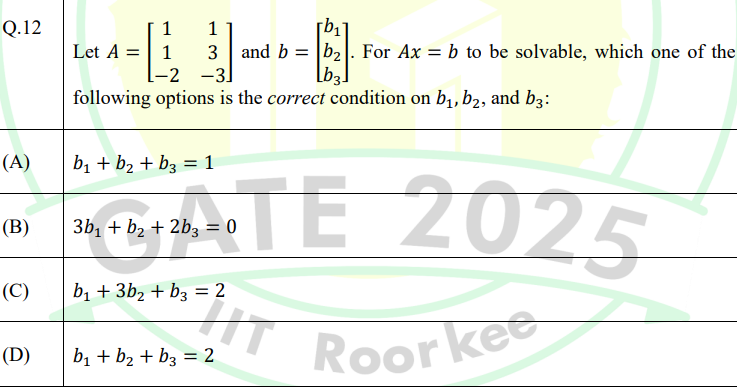
# **Civil**

## 2025

CE 1

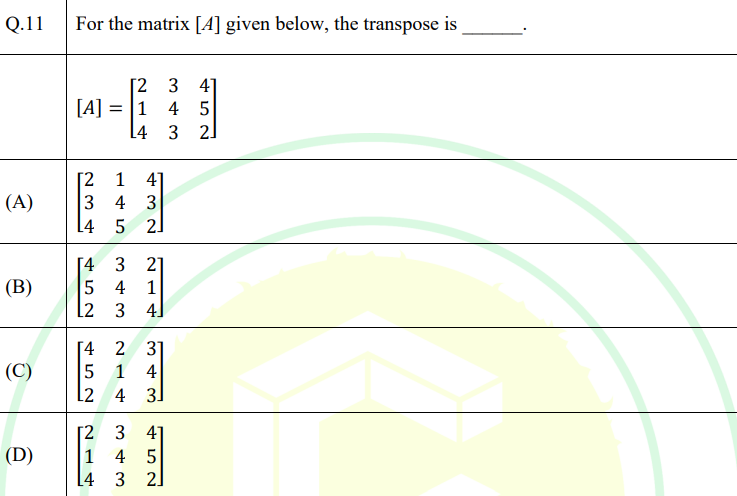


ANS: - D



ANS: - B

CE – 2



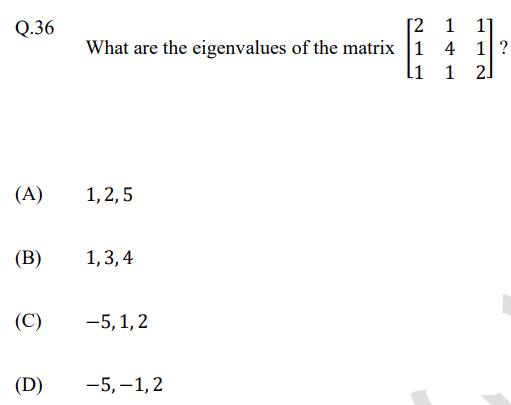
ANS: - A



ANS: - A, C

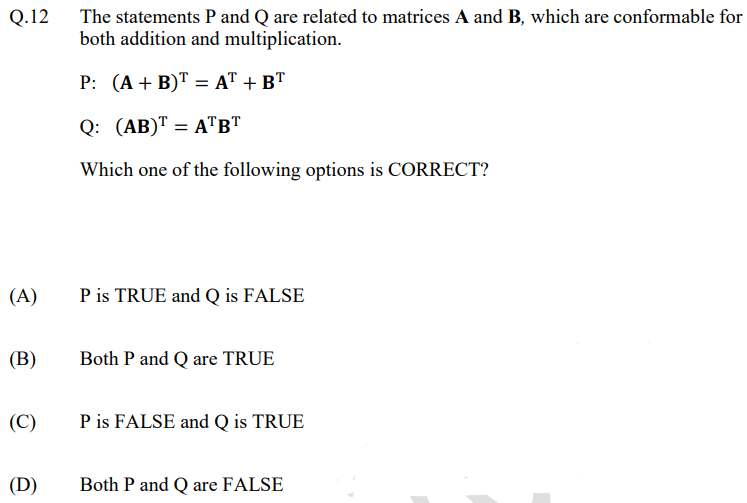
## 2024

**S1**

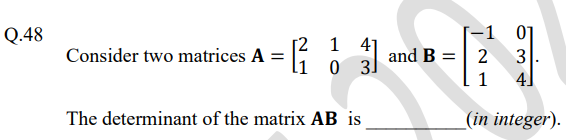


ANS: -

**S2**



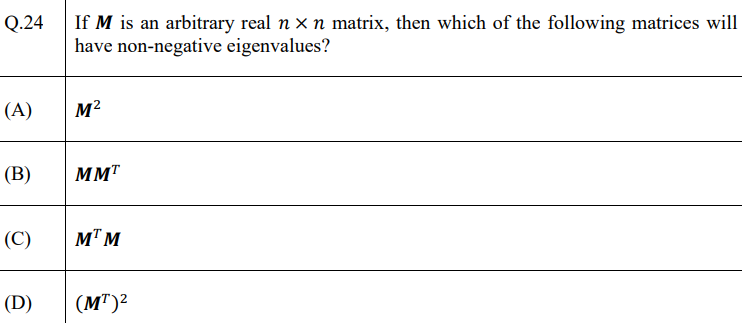
ANS: -



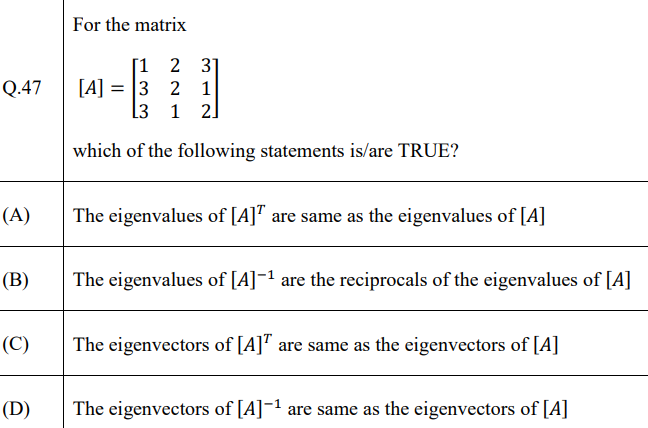
ANS: -

## 2023

**S1**

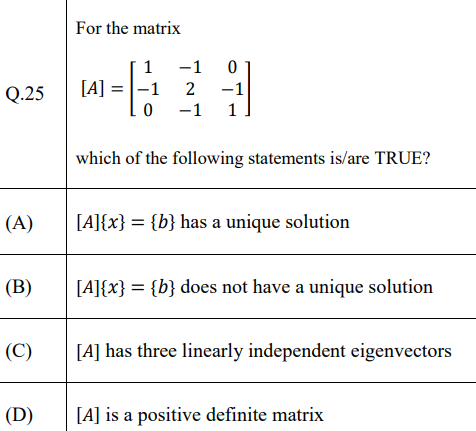


ANS: - B, C

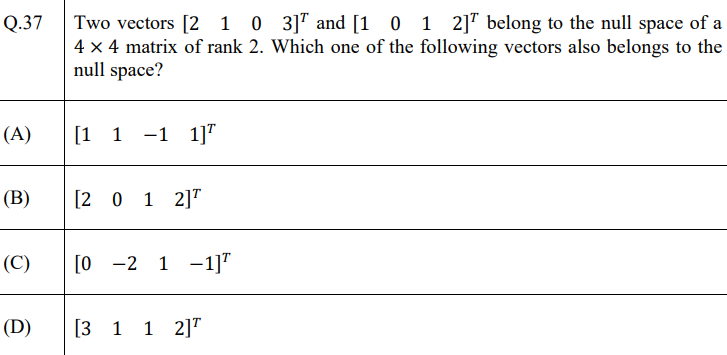


ANS: - A, B, D

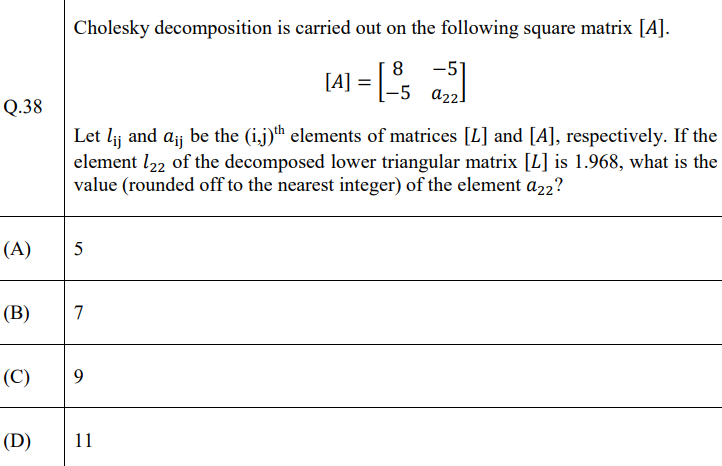
**S2**



ANS: - B,C



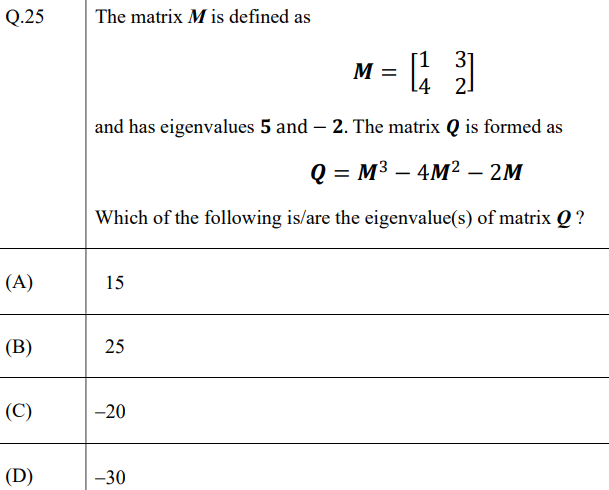
ANS: - A



ANS: - B

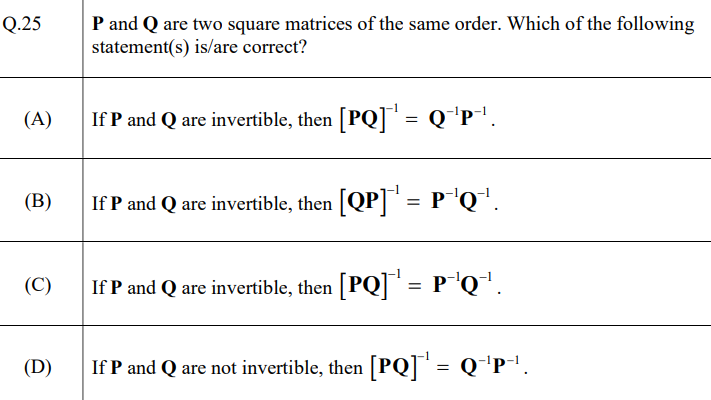
## 2022

S1

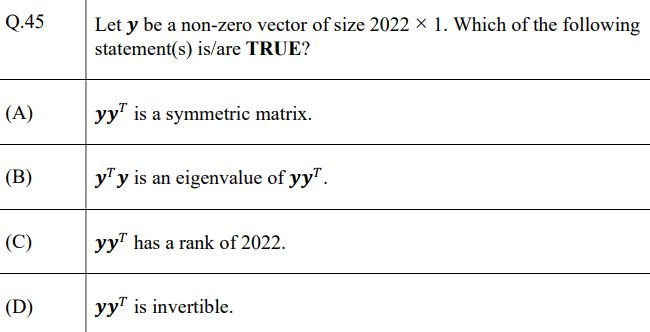


ANS: - A, C

S2



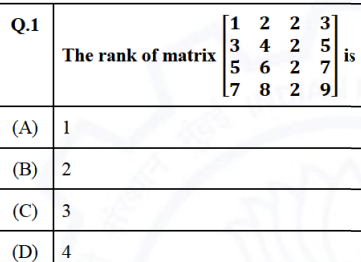
ANS: - A, B



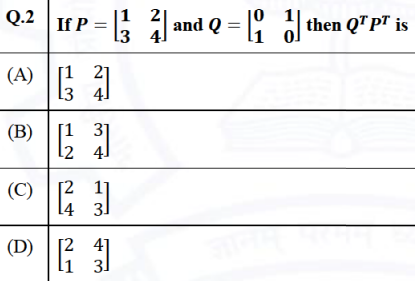
ANS: - A, B

## 2021

S1

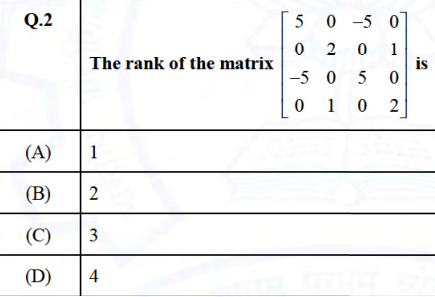


ANS: - B

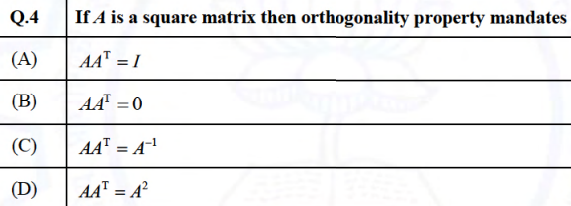


ANS: - D

S2

****

ANS: - C



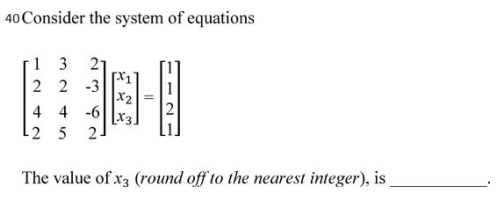
ANS: - A



ANS: - A

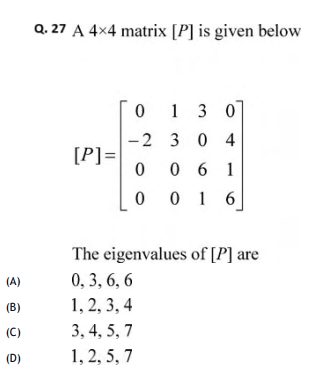
## 2020

S1



ANS: - 3

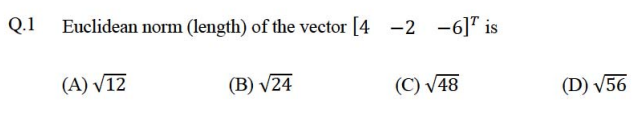
S2



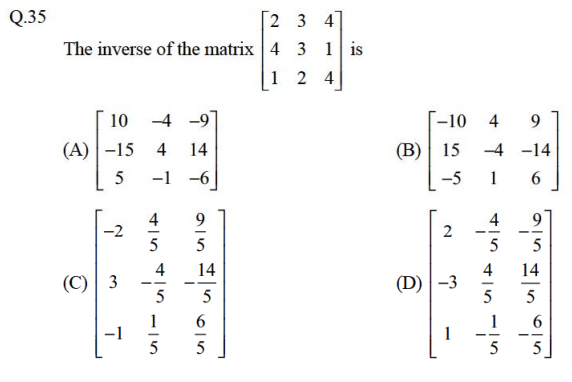
ANS: -

## 2019

S2



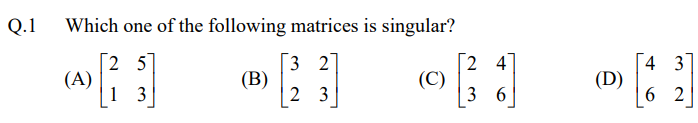
ANS: - D



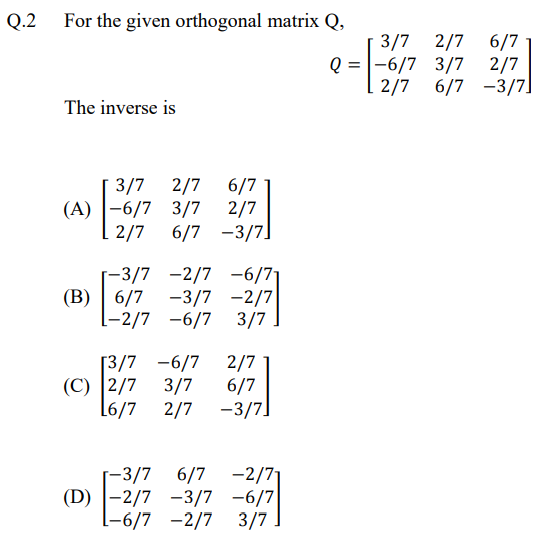
ANS: - C

## 2018

S1

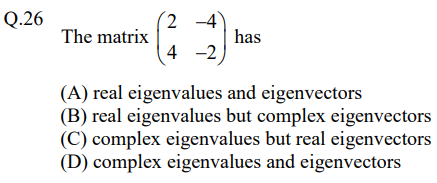


ANS: - C

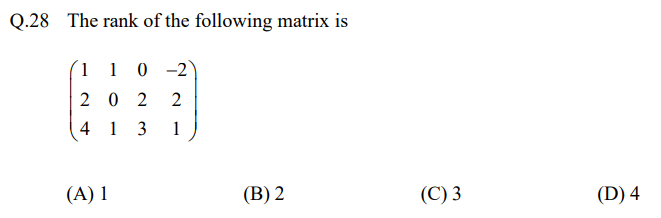


ANS: - C

S2



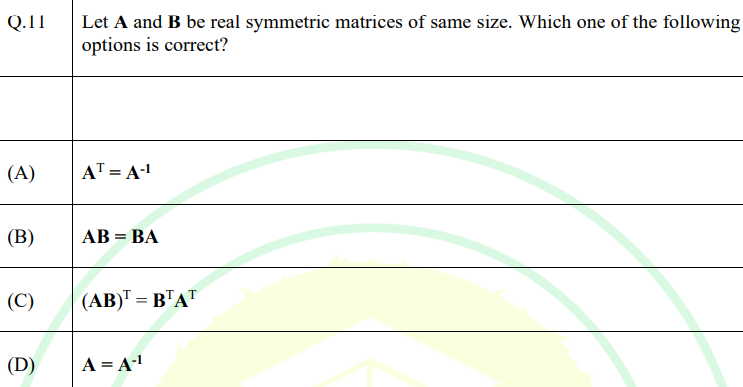
ANS: - D



ANS: - B

# **Mechanical**

## 2025



ANS: - C

## 2024

Q.14 Consider the system of linear equations

The values of 𝑎 and 𝑏 such that there exists a non-trivial null space and the system admits infinite solutions are

(A) 𝑎 = 8, 𝑏 = 14

(B) 𝑎 = 4, 𝑏 = 12

(C) 𝑎 = 8, 𝑏 = 12

(D) 𝑎 = 4, 𝑏 = 14

Q.36 The matrix (where 𝑎 > 0) has a negative eigenvalue if 𝑎 is greater than

(A) (C)

(B) (D)

ANS: -

## 2022

**SET – 1**

Q.15 If is a symmetric matrix, the value of k is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

(A) **8**

(B) **5**

(C) **−0.4**

(D)

ANS: -

Q.46 The system of linear equations in real (𝑥, 𝑦) given by

involves a real parameter 𝛼 and has infinitely many non-trivial solutions for special value(s) of 𝛼. Which one or more among the following options is/are non-trivial solution(s) of (𝑥, 𝑦) for such special value(s) of 𝛼?

(A) 𝑥 = 2, 𝑦 = −2

(B) 𝑥 = −1, 𝑦 = 4

(C) 𝑥 = 1, 𝑦 = 1

(D) 𝑥 = 4, 𝑦 = −2

**SET – 2**

Q.46 A is a 3×5 real matrix of rank 2. For the set of homogeneous equations **Ax = 0**, where **0** is a zero vector and **x** is a vector of unknown variables, which of the following is/are true?

(A) The given set of equations will have a unique solution.

(B) The given set of equations will be satisfied by a zero vector of appropriate size.

(C) The given set of equations will have infinitely many solutions.

(D) The given set of equations will have many but a finite number of solutions.

Q.48 If the sum and product of eigenvalues of a 2 × 2 real matrix are 4 and −1 respectively, then |𝑝| is \_\_\_\_\_\_ (in integer).

ANS: -

## 2021

SET – 2

Q.1 Consider an matrix A and a non-zero n × 1 vector p. Their product Ap = a²p, where a ∈ R and a ∈ {-1, 0, 1}. Based on the given information, the eigen value of A2 is:

**(A) α**

**(B) a2**

**(C)**

**(D) a4**  (D) is the correct answer

## 2020

**SET – 1**

Q. 1 Multiplication of real valued squared matrices of same dimension is

(A) Associative (B) Commutative

(C) always positive definite (D) not always possible to compute

ANS: - A

**SET – 2**

Q. 2 A matrix P is decomposed into its symmetric part S and skew-symmetric part V.

If

Then Matrix P is:

(A) (B)

(C) (D)

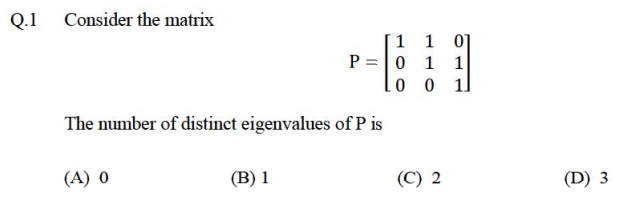
ANS: - B

Q. 19 Let I be a 100-dimensional identity matrix and E be set of distinct (no value appears more than once in E) real Eigen Values. The number of elements in E \_\_\_\_\_\_\_\_\_\_\_\_ .

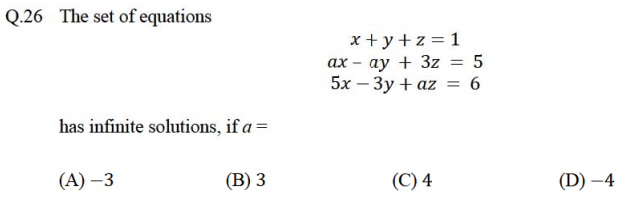
ANS: - 1

## 2019

**SET – 1**

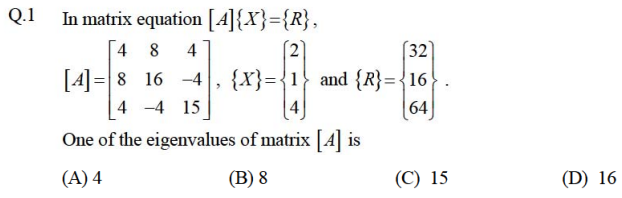


ANS: - B



ANS: - C

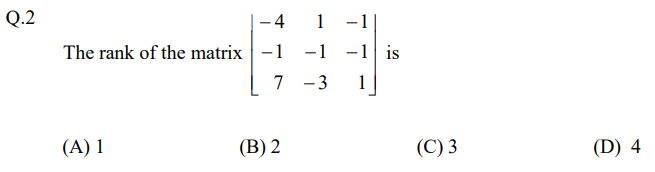
**SET – 2**



ANS: - C

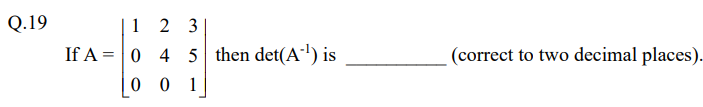
## 2018

**SET – 1**



ANS: - B

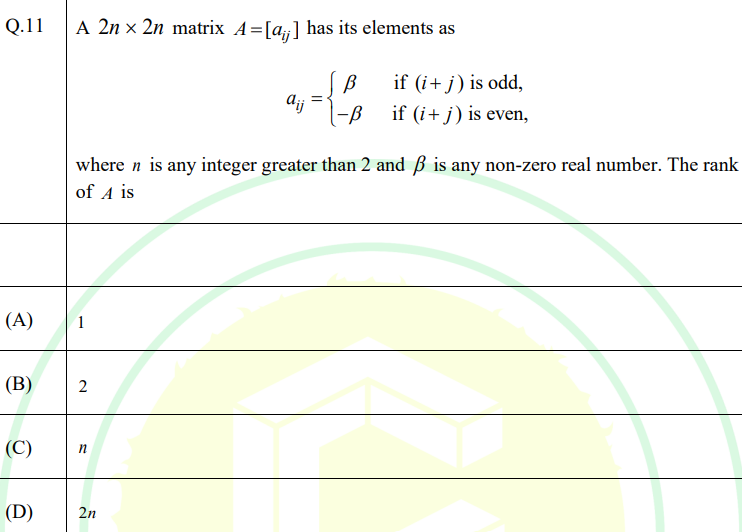
**SET – 2**



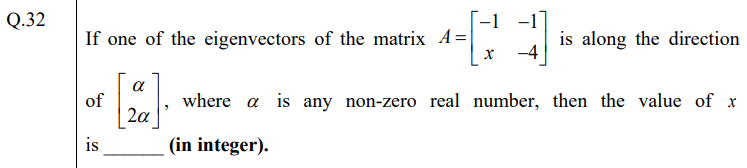
ANS: - 0.25

# **Instrumentation Engineering**

## 2025

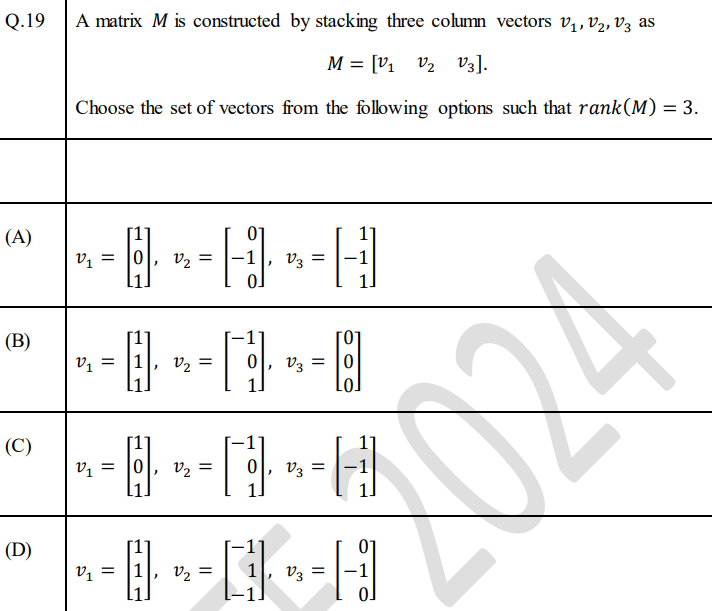


ANS: - A

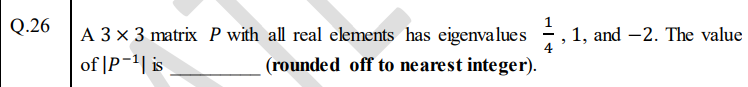


ANS: - 2

## 2024

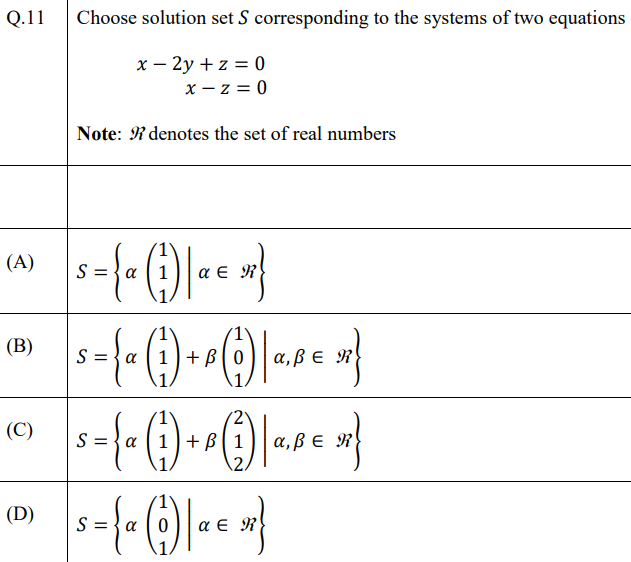


ANS: -



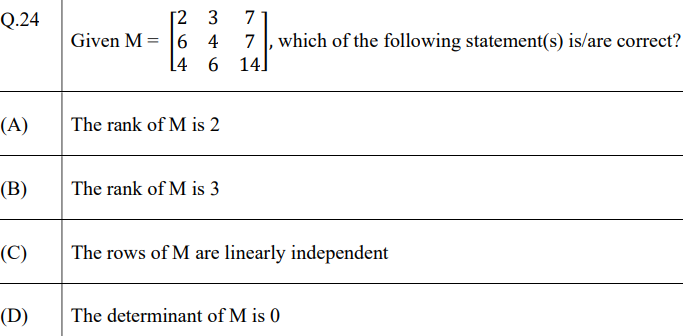
ANS: -

## 2023

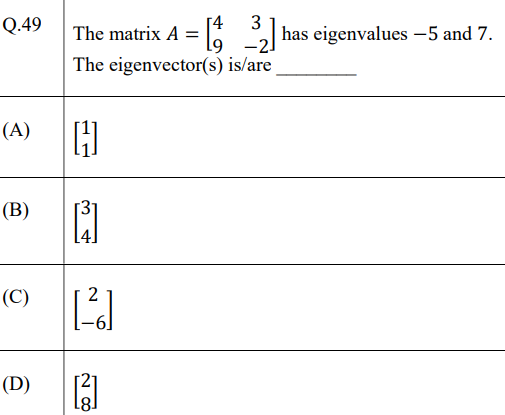


ANS: - A

## 2022

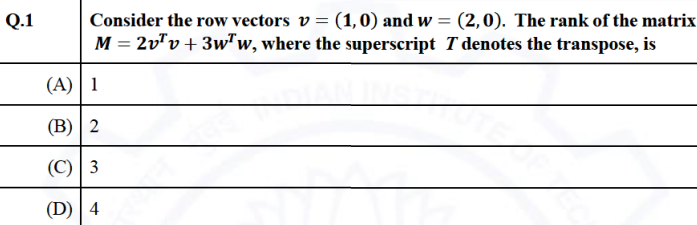


ANS: - A, D

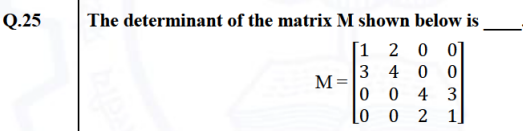


ANS: - A, C

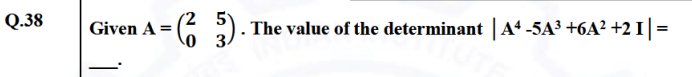
## 2021



ANS: - A

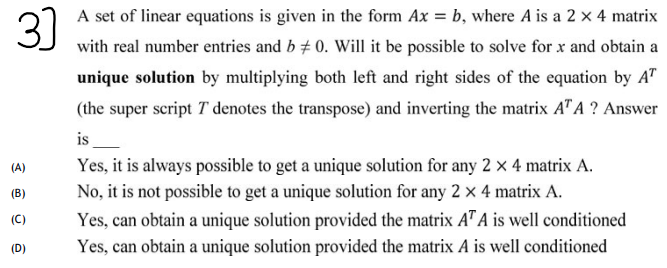


ANS: - 4

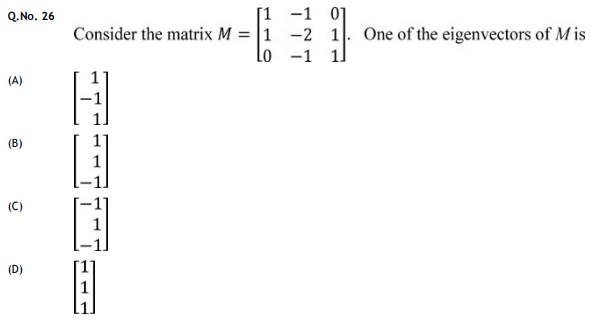


ANS: - 4

## 2020



ANS: - B



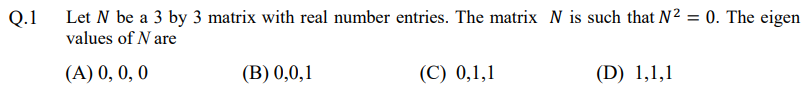
ANS: - D

## 2019

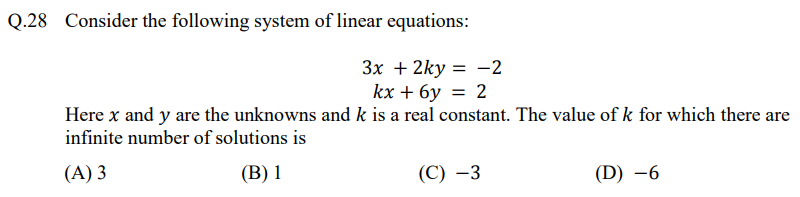


ANS: -

## 2018

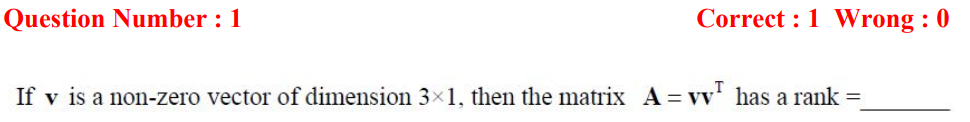


ANS: - A

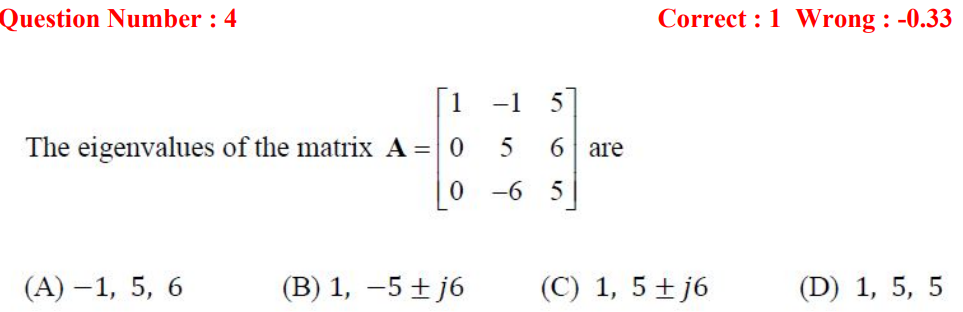


ANS: - C

## 2017

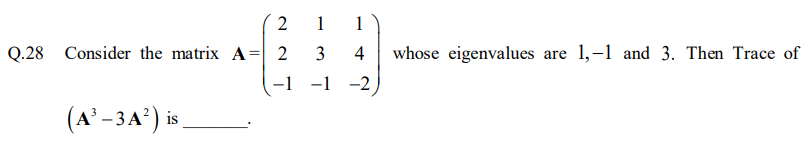


ANS: - 1



ANS: - C

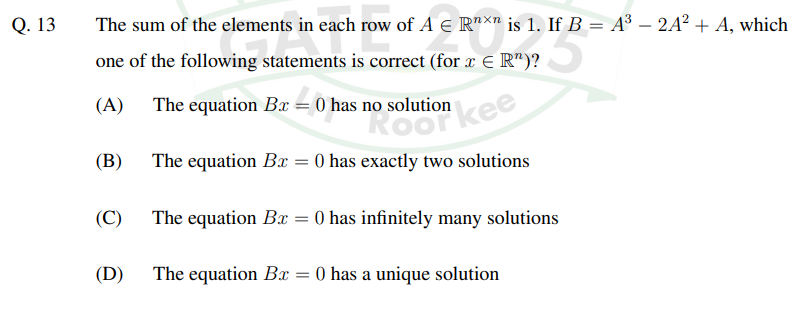
## 2016



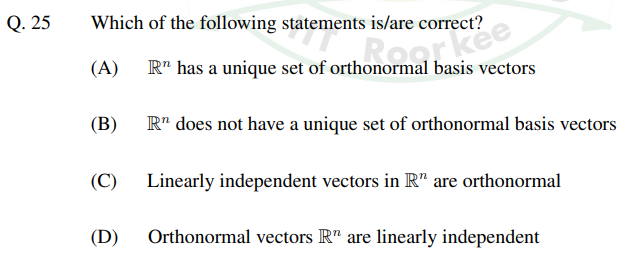
ANS: - (-6)

# **Data Science and Artificial Intelligence**

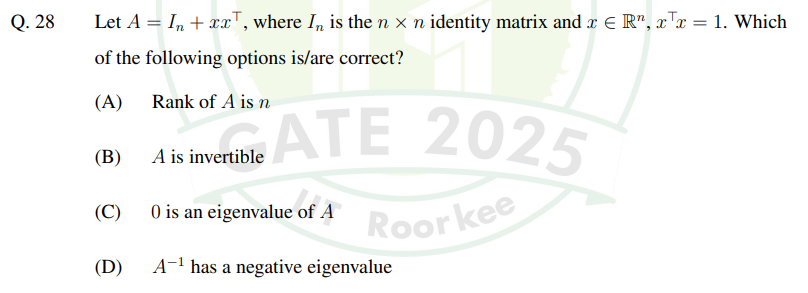
## 2025



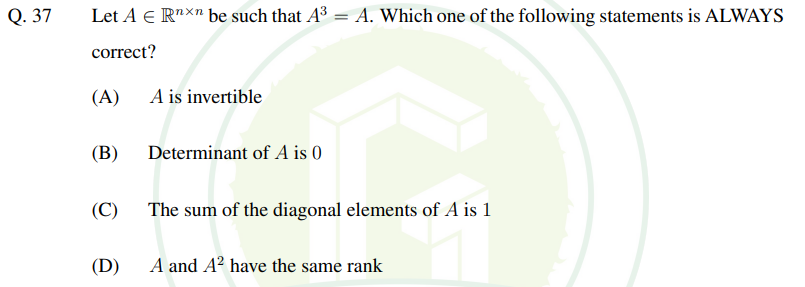
ANS: - C



ANS: - B, D



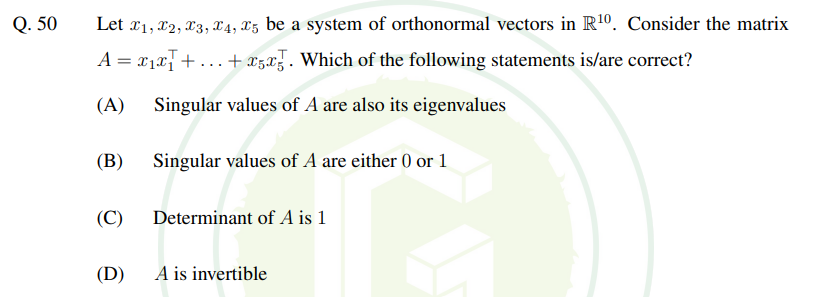
ANS: - A, B



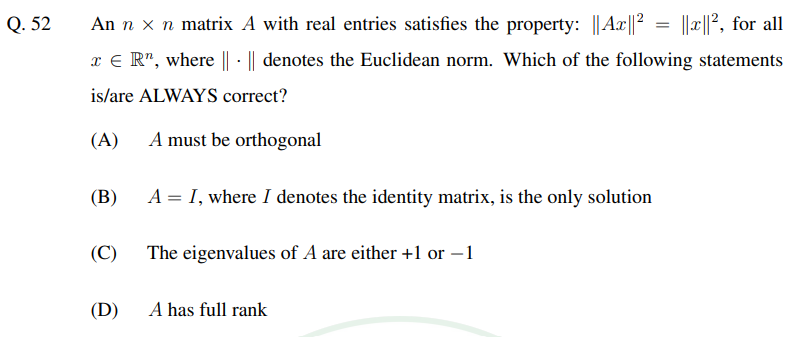
ANS: - D



ANS: - A

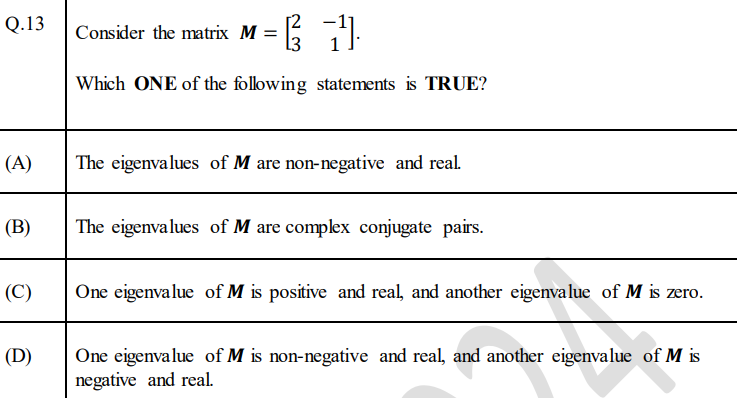


ANS: - A, B

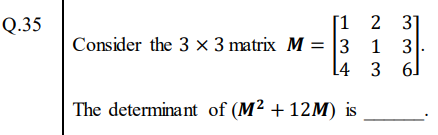


ANS: - A, D

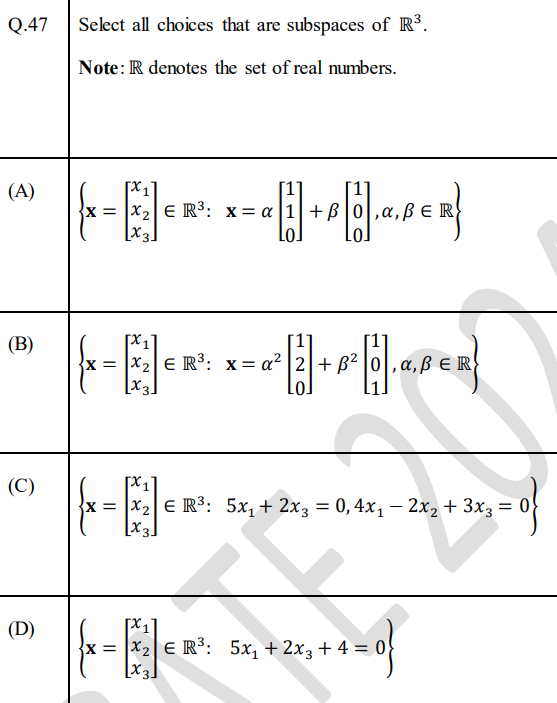
## 2024



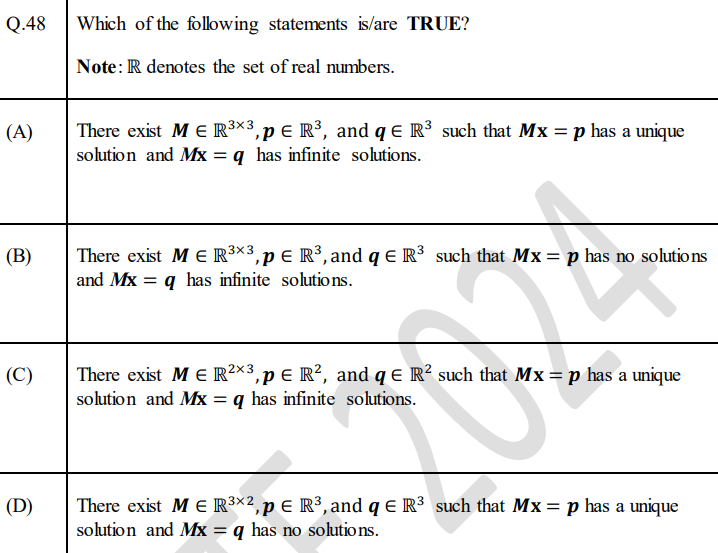
ANS: -



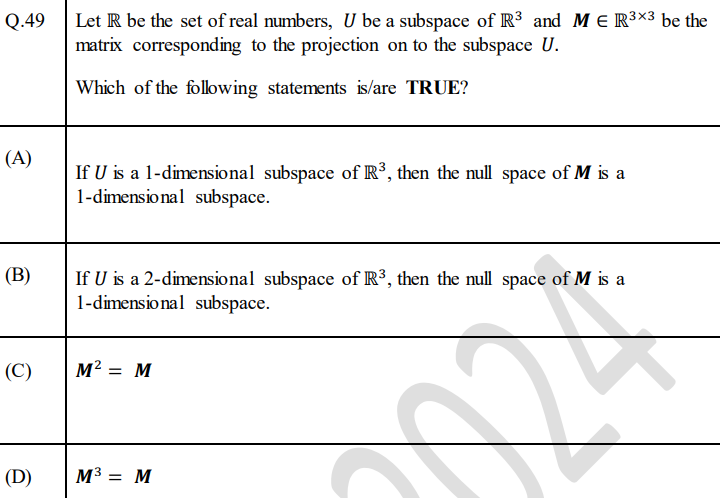
ANS: -



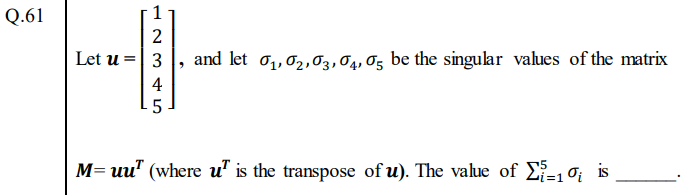
ANS: -



ANS: -



ANS: -



ANS: -