MAE101 – PT2 QUESTIONS

NOTE: REAL EXAM HAS ONLY 15 QUESTIONS! 1 0 1

**Câu 1.** Let A = [

A. 0

B. 1

�� 1 �� 3 �� 2

]. Find the (2,1)-entry of the inverse matrix ��−1.

C. None of the other choices is correct

D. -k

E. -1

**Câu 2.** Given that λ = 9 is an eigenvalue for the matrix 5 2 −2

[

2 5 −2 −2 −2 5

]

Find basic eigenvectors corresponding to λ = 9.

(i) [1 1 -1]T(ii) [1 -1 -1]T

(iii) [1 1 1]Tand [0 1 1]T(iv)[1 1 -1]Tand [1 0 1]T

A. (iii)

B. (i)

C. None of the other choices is correct

D. (ii)

E. (iv)

**Câu 3.** Find x so that the matrix [−�� �� + 1 �� − 1

0 ��2 ��]is in reduced row-echelon form.

A. 0

B. -1

C. None of the other choices is correct

D. 0 or -1

E. 1 or -1

**Câu 4.** Let A = [1 0 2 3 2 −1], B = [

1 1 2 −1 3 0

]. Find AB.

(i) (7 1

1 4) (iii)(1 1

4 1) (ii) (1 7

A. (ii)

B. (iii)

C. (i)

D. None of the other choices is correct

7 4)

**Câu 5.** Find all values of a such that the following system has nontrivial solutions �� + 2�� + �� = 0

�� + 3�� + 6�� = 0

{

2�� + 3�� + ���� = 0

A. -4

B. All of the other choices are incorrect

C. All numbers but -3

D. -3

E. All numbers but -4

**Câu 6.** Rewrite the matrix equation as a system of linear equations

5 17][����] = [117]

[14 5

A. None of the other choices is correct

B. 14x + 5y = -11, 5x + 17y = -7

C. 14x + 5y = 11, 17x + 5y = 7

D. 14x + 5y = 11, 5x + 17y = 7

E. 5x + 14y = 11, 5x + 17y = 7

**Câu 7.** John and Joe earn a total of $34 when John works 2 hours and Joe works 3 hours. If John works 3 hours and Joe works 2 hours, they get $33,5. Find John’s hourly rates (in dollars)

A. 6,5

B. 7

C. 5,5

D. 6

E. 8

**Câu 8.** Find all values of m so that the system

�� − �� − �� = 1

�� + �� − �� = 2

{

−�� + 3�� + �� = ��

has no solution.

A. None of the other choices is correct

B. 1

C. Any number but 1

D. Any real number

E. Any number but 0

F. 0

**Câu 9.** If T: R2 → R2is rotation through 2π/3, then �� [2−6] is:

(i)[3√3 − 1

√3 + 3] (ii) [1 − 3√3

√3 − 3] (iii) [√32] (iv) [3√3 − 1

3 − √3]

A. (i)

B. None of the other choices is correct

C. (iv)

D. (iii)

E. (ii)

**Câu 10.** How many solutions would a HOMOGENOUS system of linear equations of 4 equations and in 4 variables have?

A. No solution

B. Unique solution

C. Infinitely many solutions

D. There is not enough information

**Câu 11.** Find the solution of the linear system whose augmented matrix is

[

]

A. The system is inconsistent

B. (-1, 0, 1, 1)

1 2 4 6 |

0 0 1 2 0 0 0 1

9 3 1

C. None of the other choices is true

D. (-1-2t, t, 1, 1)

**Câu 12.** Find the (1, 2)-entry of the inverse of the matrix 2 2 4

]

A. -2

�� = [

1 0 1 0 1 0

B. None of the other choices is correct C. 0

D. 2

E. This matrix is not invertible �� �� ��

−�� −�� −��

**Câu 13.** If ������[

A. -3

B. 3

C. 6

�� �� �� �� �� ��

] = 2, compute ������[

2�� + �� 2�� + �� 2�� + ��

]

�� + 3�� �� + 3�� �� + 3��

D. None of the other choices is true E. -6

**Câu 14.** Let A, B, C be 10 x 10 matrices with detA = 3, detB = 2 and detC = -1. Find det(A-1 BT C-1).

A. All of the choices are incorrect

B. -6

C. 1/3

D. 2/3

E. -2/3

0 �� ��/6] = [�� 4�� −��

**Câu 15.** If 6 [3 2 −4

0 �� − 6 18], then:

A. None of the other choices is correct

B. x = 3, y = 4, z = 3

C. x = 6, y = 24, z = 6

D. x = 3, y = 4, z = ½

E. There is no solution

F. x = 18, y = 24, z = 3

**Câu 16.** Find b such that the graph of y = a + bx + cx2 passes through (0, 5), (-1, -7), (2, 11)

A. -3

B. -9

C. None of the choices is correct

D. 3

E. 9

1 2 −1

**Câu 17.** Let A be an invertible matrix such that ��−1 = [

Find the (2, 3)-entry of the matrix (3AT)-1.

A. 6

B. 2/3

C. -2/3

D. 0

E. None of the other choices is correct

0 1 2 3 0 1

].

**Câu 18.** Let A = (aij) be the matrix of rotation in the plane through π/6. Find a21. (i) ½ (ii)-1/2 (iii)√32(iv)−√32

A. None of the other choices is correct

B. (iv)

C. (i)

D. (iii)

E. (ii)

**Câu 19.** Consider the system AX = B where A is an invertible matrix with

��−1 = [

1 1 0 −2 1 3 0 4 1

],�� = [

1

0

−2

], �� = [

��1 ��2 ��3

]. Solve for x2.

A. All of the other choices are incorrect

B. -8

C. 3

D. 0

**Câu 20.** Find all numbers a such that the following matrix has rank 2. −1 4 5 3

[

]

2 3 −2 6 3 10 �� 15

A. None of the other choices is correct

B. All numbers but -1

C. All numbers but 1

D. 1

E. -1

**Câu 21.** Let A = (aij) be the 2x2 matrix of reflection in the x-axis followed by reflection in the line y = x. Find a22.

A. -1

B. 2

C. 1

D. 0

E. 2

1 + �� �� ��

**Câu 22.** Evaluate the determinant of the matrix [

A. 1-abc

B. abc

C. None of the other choices is correct D. 1+a+b+c

E. (a+b+c)/2

]

�� 1 + �� �� �� �� 1 + ��

**Câu 23.** Find all values of a such that the following system has nontrivial solutions �� + 2�� + �� = 0

�� + 3�� + 6�� = 0

{

2�� + 3�� + ���� = 0

A. All numbers but -4

B. All of the other choices are incorrect

C. All numbers but -3

D. -3

E. -4

**Câu 24.** Let A be a 2x2 matrix. Given that 1 and 2 are eigenvalues of A with corresponding eigenvectors [1 3]Tand [0 1]T. Find the (1, 2)-entry of the matrix A. A. 0

B. -3

C. 2

D. None of the other choices is true

E. 1

**Câu 25.** Let �� = [1 −1

(i) [100 −100

0 1]. Which of the following matrices is A100?

0 100 ] (ii)[1 −100

0 1] (iii) [1 1

A. (ii)

B. (i)

C. (iii)

D. All of the other choices are incorrect

0 1]

2 2 4

**Câu 26.** Find the (1,2)-entry of the inverse of the matrix A = [

A. 0

B. -2

C. None of the other choices is correct

D. This matrix is not invertible

E. 2

**Câu 27.** Solve for A if 3�� − 2���� = [2 4

1 0 1 0 1 0

]

(i) [2 0

5 0] (ii) [2 2

−1 0]

1 0] (iii) [5 0

2 0]

A. (ii)

B. (i)

C. None of the other choices is correct

D. (iii)

**Câu 28.** Let A be a matrix and x a vector defined by 5

�� = [0 8 3 6

9 0 8 −4] �� = [

8

−2 7

] Find the product Ax.

(i) [100 1] (ii) [10 10]T(iii)[100 1]T(iv) [10 10] A. (ii)

B. (i)

C. None of the choices is correct

D. (iii)

E. (iv)

1 2 ��

**Câu 29.** Find the number k for which the matrix �� = [

A. 5

B. All numbers but 5

C. All numbers but -3

D. None of the other choices is correct

E. -3

3 −1 1 5 3 −5

] has no inverse.

**Câu 30.** Let A be a matrix of size m x n. How many of the following statements are true?

(i) If A has a zero entry, then A has a row of zeros

(ii) If Ax = 0 where x ≠ 0, then A = 0.

(iii) If Ax = 0 has only the trivial solution x = 0, then Ax = b has a solution for every b A. 2 B. 3 C. 0 D. 1

**Câu 31.** Let A = [1 2

0 1], B = [0 7

matrix X is

1 1], and X such that AX = B. The second row of

A. [1 1] B. [1 0] C. [0 1] D. [-1 1] E. None of the other choices is correct

**Câu 32.** Determine how many solutions and how many parameters are possible for a homogenous system for 5 linear equation in 7 variables with augmented matrix A and rank A = 1.

A. There are 5 parameters and infinitely many solutions

B. There are 5 parameters and a unique solution

C. There are 6 parameters and infinitely many solutions

D. There are 7 parameters and infinitely many solutions

E. None of the other choices is correct

1 1 1

**Câu 33.** Find the determinant of the matrix [

A. 0

B. a+b+c

C. abc-a-2b-3c

]

�� �� + 1 �� + 2 �� + 1 �� + 2 �� + 3

D. None of the other choices is correct

E. a(b+1)(c+2)

**Câu 34.** Consider a homogenous system of 3 linear equations in 5 variables. Assume that the augmented matrix has rank 2. Choose correct statements.

A. There are exactly 2 parameters

B. The system has no solution

C. There are exactly 3 parameters

D. None of the other choices is correct

E. The system has only the trivial solution

**Câu 35.** Let �� = [1 1

1 1]. Find the (1, 1)-entry of A10.

A. 1024 B. 512 C. 10 D. 20 **Câu 36.** Given that -3 is an eigenvalue for the matrix [3 −6

8 −11]. Find all eigenvectors

corresponding to this eigenvalue λ = -3.

A. None of the other choices is correct

B. t(1, 1), t is nonzero

C. t(1, -2), t is nonzero

D. t(1, -1), t is nonzero

E. t(2, 1), t is nonzero

**Câu 37.** Let A = (aij) be the matrix of rotation in the plane through π/3. Find a12. (i) ½ (ii)-1/2 (iii)√32(iv)−√32

A. None of the other choices is correct

B. (iv)

C. (iii)

D. (ii)

E. (i)

3 2 1

**Câu 38.** Find the rank of the matrix [

2 1 3 5 3 4

]

A. 2 B. 0 C. 1 D. 3

**Câu 39.** Let A = [1 0 2 3 2 −1], B = [

1 1 2 −1

]. Find B – 2AT.

(i) (

−1 5 2 −5 −1 2

) (ii) (

−1 5 2 −5 1 2

3 0

) (iii)(

−1 −5 2 −5 −1 2

)

A. (ii)

B. (iii)

C. (i)

D. None of the other choices is correct **Câu 40.** Find the product AB, where: �� = [

−5 7 6 9 −3 −1 2 4 −8

] and �� = [

2 8 5

]

(i) [76 -11 -4 ]T(ii) [75 -11 -4]T (iii)[76 -12 -4]T(iv) [76 -11 -3]T

A. (iv)

B. (ii)

C. (iii)

D. None of the other choices is correct

E. (i)

**Câu 41.** Solve for the following system of linear equations. �� + �� + �� = 2

2�� + 3�� − �� = 8

{

�� − �� − �� = −8

A. (-3; 19/4; ¼)

B. None of the other choices is correct C. (-3; 17/4; -1/4)

D. The system is inconsistent

E. (3; 19/4; -1/4)

**Câu 42.** Find the (2,3)-entry of the product 1

[

−2 3

][0 5 −4]

A. -14 B. -22 C. 15 D. 8 E. None of the other choices is correct