

**Write all the answers. (Marks in the bracket)**

1. Name any two RDBMS software. **[2]**
2. What is the default database used in the chrome browser? **[1]**
3. Which tag do you use for carriage return in basic HTML ? **[1]**
4. Which famous scripting ecosystem is an asynchronous event loop? **[1]**
5. What is the initialisation command for node js ? **[1]**
6. What is the advantage of next.js over other front end architectures? **[1]**
7. What does ORM stand for ? **[1]**
8. What does API stand for ? **[1]**
9. What does CSS stand for ? **[1]**
10. In web development, what does HTML stand for ? **[1]**
11. Which HTML tag is used to insert a hyperlink in a webpage. **[1]**
12. Write a single line Matlab code for adding integer numbers from -5 to 100. **[1]**
13. Write a single line Matlab code for adding square of integers from -5 to 100. **[1]**
14. Write a single line Matlab code for adding of numbers from 1 to 100 that are divisible by 3 or 5 (hint: use mod function). **[1]**
15. Write a single line Matlab code to create a matrix of size  $4 \times 7$  of rank 3. **[1]**
16. Write a two line Matlab code to create data for 2 variable regression of the form  $y = mx + c$ , with  $m = 3$  and  $c = -4$  and  $x$  in the range  $-5$  to  $+5$  with an increment of 1. Add noise from  $N(0, 1)$  for all the  $y$  values created to form a new set of  $y$  values. **[2]**
17. Write a single line Matlab code to solve the regression problem (finding  $[m;c]$  vector ) given in Q5. **[2]**

18. You are given a matrix  $A_{m \times n}$ , what is the tuple size of the vector  $y$  that can be projected on to the column space of the matrix  $A$ . **[1]**
19. You are given a matrix  $A_{m \times n}$ , what is the tuple size of the vector  $y$  that can be projected on to the row space of the matrix  $A$ . **[1]**
20. You are given a matrix  $A_{m \times n}$ , what is the tuple size of the vector  $y$  that can be projected on to the right null space of the matrix  $A$ . **[1]**
21. You are given a matrix  $A_{m \times n}$ , what is the tuple size of the vector  $y$  that can be projected on to the left null space of the matrix  $A$ . **[1]**
22. You are given a matrix  $A_{m \times n}$  with independent columns, what is the formula for the projection matrix to project on to the column space of  $A$ . **[1]**
23.  $A$  is a  $3 \times 3$  matrix with 2nd column twice the 1st column and 3rd column is independent of the 1st two columns. How will the rref matrix of  $A$  look like? How many zero rows and non zero rows will be present in the rref matrix of  $A$ ? **[4]**
24. Explain how will you create a  $3 \times 3$  asymmetric matrix with rank 2 and with column space = row space. **[3]**
25. Explain how will you create a  $3 \times 3$  generic integer matrix with determinant = 1. **[4]**
26. What is the output of convolution if a sequence  $\{1, 1\}$  is convolved with itself. **[2]**
27. What is the outout of convolution if sequence obtained in the previous question is convolved again with  $\{1, 1\}$ . **[2]**

### True or False (1 mark each)

1. FFT is a tool that can be used for convolving sequences .
2. 2D FFT is a tool that can be used for filtering images.
3. DFT basis set are orthogonal basis set.

4. In a symmetric matrix, Right Null Space = Left Null Space
5. Right null space = Left null space  $\Rightarrow A$  is symmetric
6. Row space = Column space  $\Rightarrow A$  is symmetric
7.  $A$  is an  $m \times n$  matrix, with  $m \neq n$ . we can create such a matrix with Row space = Column space.
8.  $A$  is a  $5 \times 3$  matrix, a 5 tuple vector can be projected on to row space.
9.  $A$  is a matrix.  $A^T A$  and  $AA^T$  have same rank.
10.  $A$  is an  $m \times n$  matrix, with  $m \neq n$ , Column space of  $A$  and  $A^T A$  are same

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