Deep Learning for Visual Computing

Assignment – Week 0

Type of Questions: MCQ

Number of questions: 20 **Total marks: $20 \times 1 = 20$**

QUESTION 1:

Given $F(x, y) = 2\sin(2x) + y$. Determine $\frac{\partial F}{\partial x}$ at $x = 30°$.

a. 2
b. 5
c. 1
d. 3

Correct Answer: a. 2

QUESTION 2:

Given $y = e^{3x} + \cos(3x) + \ln(x)$. Determine $\frac{dy}{dx}$

a. $3e^{3x} + 3\sin(3x) + \frac{1}{x}$
b. $3e^{3x} - 3\sin(3x) + \frac{1}{x}$
c. $e^{3x} - 3\sin(x) + \frac{1}{x}$
d. $e^{3x} + 3\sin(x) + \frac{1}{x}$

Correct Answer: b. $3e^{3x} - 3\sin(3x) + \frac{1}{x}$

QUESTION 3:

Common types of problems in machine learning is

a. Clustering

b. Regression

c. Classification

d. All of the above

Correct Answer: d. All of the above

In machine learning, we deal with clustering, regression, and classification, etc.

QUESTION 4:

The linear system a+b = 2, a-b = 0 represents

a. Two lines in $\mathbb{R}^2$ intersecting at a point.

b. The same line in $\mathbb{R}^2$

c. Two parallel lines in $\mathbb{R}^2$, No intersection.

d. None of these.

Correct Answer: a. Two lines in $\mathbb{R}^2$ intersecting at a point.

QUESTION 5:

Characteristic equation for the matrix $\boldsymbol{X}$ is given as, $2t^2 + t = 1$. Which of the following is true for $\boldsymbol{X}$?

a. $\boldsymbol{X^{-1} = X}$
b. $\boldsymbol{X^T = X^{-1}}$
c. $\boldsymbol{X^{-1} = 2X + I}$
d. $\boldsymbol{X = 2X^{-1} + 1}$
Correct Answer: c. $\boldsymbol{X^{-1} = 2X + I}$

QUESTION 6:

How many solutions of x, y, z exists for the given set of equations?

$$2x - y + 3z = 1$$
$$3x - 2y + 5z = 2$$
$$-x + 4y + z = 3$$

a. 2
b. 1
c. 4
d. Infinite
Correct Answer: b. 1

QUESTION 7:

Every Hermitian matrix can be expressed as A + iB, where A and B are real then

a. A is symmetric, B is skew − symmetric

b. A is Hermitian, B is skew − Hermitian

c. A is skew − symmetric, B is symmetric

d. A and B are both skew − symmetric.

Correct Answer: **a.** A is symmetric and B is skew- symmetric.

QUESTION 8:

Which of the following is/are Limitations of deep learning?

a. Only data labeling

b. Only obtain huge training datasets

c. Both a and b

d. None of the above

Correct Answer: c. Both a and b

In deep learning the main limitation is training data availability and labeling.

QUESTION 9:

Let $\boldsymbol{X} = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 0 & 1 \\ 0 & 1 & -1 \end{bmatrix}$. Then $|\boldsymbol{XX^T} + 1|^T$ =?

a. 1

b. 6

c. $\begin{bmatrix} 4 & 0 & 3 \\ 0 & 2 & 0 \\ 3 & 0 & 3 \end{bmatrix}$

d. $\begin{bmatrix} 3 & -1 & 2 \\ -1 & 1 & -1 \\ 2 & -1 & 2 \end{bmatrix}$

Correct Answer: b. 6

QUESTION 10:

Let f : $(0,\infty) \rightarrow \mathbb{R}$ which of the following functions do not have monotonic growth or drop trend?

a. f(x) = xsin(x)

b. $f(x) = e^x$

c. f(x)= x ln x

d. All of the above

Correct Answer: a. f(x) = xsin(x)

QUESTION 11:

Find the bound of the function, $f(x) = \frac{1-e^{-x}}{1+e^{-x}}$, when $x \in [0, \infty)$.

a. $[0.5, \infty)$
b. $(-\infty, \infty)$
c. $(-\infty, 1)$
d. [0,1)
Correct Answer: d. $[\mathbf{0}, \mathbf{1})$

QUESTION 12:

Consider two independent random variables X and Y with variance ${\sigma^2}_X$ and ${\sigma^2}_Y$ respectively. What is the variance of $X - Y$?

a. ${\sigma^2}_X + {\sigma^2}_Y$
b. ${\sigma^2}_X - {\sigma^2}_Y$
c. $\frac{(\sigma_X - \sigma_Y)^2}{4}$
d. $\frac{{\sigma^2}_X + {\sigma^2}_Y}{2}$

Correct Answer: a. $\boldsymbol{{\sigma^2}_X + {\sigma^2}_Y}$

QUESTION 13:

If the order of the matrix A is m× p. And the order of B is p×n. Then the order of matrix AB is?

a. n×p
b. m×n
c. n×p
d. n×m
Ans b. m×n
Correct Answer: b. If A = m×p and B= p× n then AB = m×n [p will be cancel out]

QUESTION 14:

Given two discrete distributions $p(\cdot)$ and $q(\cdot)$, distance between them can be measured using $d_1(p||q) = \sum_i p_i \log\left(\frac{p_i}{q_i}\right)$ or $d_2(p||q) = \sum_i p_i \log\left(\frac{p_i}{M}\right) + \sum_i q_i \log\left(\frac{q_i}{M}\right)$, where M is a constant. Which of the following about the symmetry of the distance measures is true?

a. Both $d_1(p||q)$ and $d_2(p||q)$ are asymmetric
b. Both $d_1(p||q)$ and $d_2(p||q)$ are symmetric
c. $d_1(p||q)$ is symmetric and $d_2(p||q)$ is asymmetric
d. $d_1(p||q)$ is asymmetric and $d_2(p||q)$ is symmetric

Correct Answer: d. $d_1(p||q)$ is asymmetric and $d_2(p||q)$ is symmetric

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QUESTION 15:

In real numbers, additive identity is

a. 1

b. 3

c. 0

d. -1

Correct Answer: **c.** In real numbers additive identity is zero.

QUESTION 16:

Given $f(x) = \frac{x^3-3x^2+3x-2}{2x^3+x^2-8x-4}$, which is not differentiable at $x = 2$. What could be an exception value of $f(x = 2)$ such that $f(x)$ is continuous?

a. 0
b. $\frac{3}{13}$
c. $\frac{3}{20}$
d. None of these

Correct Answer: c. $\frac{3}{20}$

QUESTION 17:

Eigenvalue of real symmetric matrix is:

a. Complex

b. Negative

c. Real

d. Positive

Correct Answer: c. Real

QUESTION 18:

Consider two 3-D tensors $\boldsymbol{X}$ and $\boldsymbol{Y}$ whose contents are,

$$\boldsymbol{X}(:,:,0) = \boldsymbol{X}(:,:,1) = \boldsymbol{X}(:,:,2) = \begin{bmatrix} 1 & 3 & 1 \\ 6 & 4 & 0 \\ 5 & 2 & 5 \end{bmatrix}$$

$$\boldsymbol{Y}(:,:,0) = \boldsymbol{Y}(:,:,1) = \boldsymbol{Y}(:,:,2) = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

If the convolution operation is given as $\boldsymbol{Z} = \boldsymbol{X} * \boldsymbol{Y}$, find $\boldsymbol{Z}(:,:,1)$.

a. [18]

b. $\begin{bmatrix} 1 & 3 & 1 \\ 6 & 4 & 0 \\ 5 & 2 & 5 \end{bmatrix}$

c. [10]

d. $\begin{bmatrix} 2 & 4 & 2 \\ 6 & 4 & 1 \\ 6 & 2 & 5 \end{bmatrix}$

Correct Answer: c. [10]

QUESTION 19:

In a Poisson Distribution, the mean and variance are equal.

a. True

b. False

Correct Answer: a. True

QUESTION 20:

A box has 6 white, 2 black ,8 grey and 4 green balls. If one ball is picked randomly from the pot, what is the probability of being white or grey?

a.7/10

b. 1/3

c.4/7

d. 3/10

Correct Answer: a. 7/10

Solution: We want white or grey balls. 6 balls are white and 8 are grey.

Total balls = 20

Probability = 6/20 + 8/20 = 7/10