Department of Computer Science

Gujarat University

M.Sc. (Artificial Intelligence & Machine Learning) - Defense Specific

Semester – II

Numerical Optimization

Date: 13th May 2022 **Time: 2:00-3:30 pm** **Max. Marks: 40**

Q1. Answer the following questions

[10]

a) Find ∂f/∂x, ∂f/∂y, ∂f/∂z for the given function, $f(x, y, z) = x\cos z + x^2y^3e^z$

b) What is concave and convex function?

c) Find ∂f/∂x, ∂f/∂y, ∂f/∂z for the given function, $f(x, y, z) = y\frac{x}{y} + y + z$

d) Give any two examples of multivariate function.

e) Find the derivative of the function $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

Q2. Answer the following questions

[09]

a) Show that if a is a constant, then u(x,t) = sin(at)cos(x) is a solution to.

$$\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$$

b) Brief maxima and minima of a function.

c) Find the Maclaurin series for f(x) = x cos(x).

Q3. Answer the following questions

[21]

a) Find the first 4 terms of the Taylor series for the function sinπx about x=0.5. Use your answer to find an approximate value to $\text{Sin}\left(\frac{\pi}{2} + \frac{\pi}{10}\right)$.

b) What is continuity? Explain its types.

c) Find the maxima and minima of $4x^3 - 18x^2 + 24x - 7$.

Date: 10 / 05 / 2022
Max. Marks: 40

Subject: Statistical Foundation
Time: 1 hr 30 min

Instruction:
1) Scientific calculator is allowed.
2) Accurate upto 3 decimal places

Q.1 Explain any two of the following: (10)
(a) Percentile
(b) Explain skewness.
(c) Describe any one application of Bayes Theorem.

Q.2 The average number of calories in a regular size cookie is 240. If the standard deviation is 38 calories, find the range in which at least 75% of the data will lie. Use Chebyshev's theorem. (5)

Q.3 The coefficient of correlation between price of car and price of truck is 0.48. The covariance is 36. The variance of price of car is 16. (5)
a) Find the standard deviation of price of truck.
b) What can you interpret from the coefficient of correlation given above?
c) If the mean price of car is 78 and mean price of truck is 15, which one of the two shows more variability in pricing?

Q.4 Name the measure of central tendency which can be used in following situation: (5)
a) One-half of the factory workers make more than Rs.55 per hour, and one-half make less than Rs. 55 per hour.
b) The average number of children per family in the Plaza Heights Complex is 1.8
c) Most people preferred convertibles over any other color.
d) The average person cuts the lawn once a week.
e) The average age of college professors is 42.3 years.

Q.5 Is it possible to have a sample space in which P(A) = 0.4, P(B) = 0.6, and P(A and B) = 0.35? Give reason. Given this information, would events A and B be mutually exclusive? Would they be independent? (5)

Q.6 An archer has a 30% chance of hitting the bull's eye on the target. (5)
(a) What is the probability that she hits the target with one and only one of two arrows?
(b) What is the probability that she hits the target with both arrows?

Q.7 A lab test is 99% effective in detecting a disease when in fact it is present. However, the test also yields a false positive for 0.5% of the healthy patients tested. If 1% of the population has that disease, then what is the probability that a person has the disease given that his/her test is positive? (5)

Gujarat University

M.Sc. (Artificial Intelligence & Machine Learning)

Semester-II

Advanced Python

Date: 11th May 2022 **Max. Marks:30**

Time: 2:00-3:30 pm

Q1. Define data preprocessing. What are the criteria for good data quality. Give the importance of data preprocessing [5]

Q2. Explain various stages of data preprocessing. [10]

Q3. How can u handle the following in data : [5]

Inconsistence records

Duplicate or Null records

Unnecessary columns

Q5. What are the different types of missing values. Explain methods for handling missing values. [10]

OR

Q6. What are outliers? What is their side effects to data. Explain different ways to handle the outliers. [10]

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Sessional – 1

Subject : Computer Vision **Marks :25**

Attempt any FIVE questions given below. Each question carries [5] marks

Q1. Define Computer Vision. Define image,resolution and quantisation. Explain the process of vision in terms of:
- illumination
- Reflection
- Absorption

Q2. What are intensity transform on image. explain each with example & applications.
- Negation
- Log transform
- Power law transform
- Gray level slicing
- - Bit plane slicing

Q3. What are the different arithmetic and bitwise manipulation that can be performed on image list application of each.

Q4. Define convolution. Write response for the given spatial filter. Explain effects and applications of each
1. Mean
2. Median
3. Weighted mean
4. Max mean

Explain effects and applications of each

Q5. Explain the two mathematical operators for detecting edges. Write filters for the same.

Q6. What are the different geometric transformations on the image. Write matrices for the same.

Q7. Explain different color models
i. RGB
ii. Cmy
iii. CMYK
iv. HIS
v. Gray

GUJARAT UNIVERSITY
MACHINE LEARNING
SESSIONAL-I

Maximum Marks : 30

Date : 11/04/2022
Time : 10.30 p.m. – 12.00 p.m.

Note : (1) Give suitable examples wherever necessary.
(2) Write precise and to the point answers.

Q.1 Answer the following (Any Three) **[12]**

(a) How can we choose K in K-means algorithm?
(b) What is hierarchical clustering? How do we compute distance between two clusters?
(c) Explain the concept of Fuzzy C means algorithm in your own words.
(d) Differentiate between internal and external cluster validation.

Q.2 Answer the following **[8]**

(a) What are the pros and cons of using KNN ? Explain in brief.
(b) What is the need to perform standardization/normalization of data before KNN Imputation? Explain with the help of simple example.

Q.2 Answer the following OR **[8]**

(a) Following table has list of some people and the types of laptops and phones they have.

name	laptop	phone
Kate	PC	Android
Tom	PC	Android
Harry	PC	Android
Annika	Mac	iPhone
Naomi	Mac	Android
Joe	Mac	iPhone
Chakaday	Mac	iPhone
Neelix	Mac	Android
Kes	PC	iPhone
B'Elanna	Mac	iPhone

(a) What is the probability that a randomly selected person uses an iPhone?
(b) What is the probability of a person owning a mac given that they own an iphone ?

(b) How to calculate probability attribute with continuous data ? Explain giving suitable examples.

Q.3 Answer the following (Any Two) **[10]**

(a) Define Distance Measure. On the space of nonnegative integers, which of the following functions are distance measures? Justify your answer.

(a) $\max(x, y)$ = the larger of x and y.
(b) $\text{diff}(x, y) = |x - y|$ (the absolute magnitude of the deference between x and y).
(c) $\text{sum}(x, y) = x + y$.

(b) (i) Explain cosine similarity
(ii) Find the edit distances (using only insertions and deletions) between the following pairs of strings.

A. abcdef and bdaefc.
B. abccdabc and acbdcab.
C. abcdef and baedfc.

(c) What are the factors that may impact accuracy of classifiers ? Explain.

GOOD_LUCK