

Total No. of printed pages = 3

CSE 1817 OE 21

05/01/2023

Roll No. of candidate

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2022

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B.Tech. 7<sup>th</sup> Semester End-Term Examination

MACHINE LEARNING

(New Regulation w.e.f 2017 – 18 & New Syllabus w.e.f 2018 – 19)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Attempt questions number 1 (Q1) and any *four* from the rest

1. From (i) to (j) there are 10 (ten) questions with multiple choices, choose the correct one : (10)
- (i) If input  $x \in X$  and output  $y \in R$  'n' numbers of training examples are samples randomly from a distribution  $P(x, y)$ , the goal is to minimize the prediction error on
- (a) new  $(x, y)$  (b) existing  $(x, y)$   
(c) both (a) and (b) (d) neither (a) or (b)
- (ii) Termination conditions for ID3/C4.5 algorithm is
- (a) all records belong to same class for a node  
(b) no remaining attributes left  
(c) both (a) and (b) are true  
(d) only (a) is true and (b) is not
- (iii) Decision system is
- (a) set of decision attributes  
(b) set of condition attribute  
(c) set of state space  
(d) all of these

[Turn over

- (iv) if  $\langle P, TE \rangle$  represents a well defined learning task then
- (A) P is precision improvement
  - (B) T is time to deliberate
  - (C) E is experience
  - (a) (A) and (B) are true
  - (b) (B) and (C) are true
  - (c) only (C) is true
  - (d) all are true
- (v) Inductive bias is to
- (A) Impose frame ordering for hypothesis space
  - (B) Extend limitation to hypothesis space
  - (a) (A) is true only
  - (b) (B) is true only
  - (c) both (A) and (B) are false
  - (d) both (A) and (B) are true
- (vi) Observe the statements
- (A) very small very low power,
  - (B) adapt using locally available signals. These are related to
  - (a) RAM
  - (b) Synapses
  - (c) Axon
  - (d) Both (a) and (b)
- (vii) Which of the following does not represent row in a table of data (dataset)?
- (a) instances
  - (b) measurements
  - (c) features
  - (d) samples
- (viii) In Inductive learning a collection of examples  $(x^{(i)} f(x^{(i)}); i = 1, 2, \dots, N$ , of a function  $f(x)$ , return a \_\_\_\_\_ that approximates  $f(x)$ .
- (a) bias
  - (b) reference value
  - (c) approximation function
  - (d) hypothesis function
- (ix) In case of tree splitting the attributes to specify test condition are of type
- (a) Nominal
  - (b) Ordinal
  - (c) Continuous
  - (d) All of these
- (x) For a regression function  $f(x, w_1, w_0)$ , the parameters need to set are
- (a) only  $x$
  - (b) only  $w_0$
  - (c) only  $w_1$
  - (d) both  $w_1$  and  $w_0$

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2. What is linear regression? Give a graphical representation with a brief explanation. How error can be computed? How multivariate regression is represented? (2+8+2+3=15)
3. A model is applied to datasets of 2000 observations, in which 800 observations actually positive are correctly predicted, and 250 are incorrectly predicted. And 750 observations are actually negative and incorrectly predicted and 200 are correctly predicted. Evaluate Success rate, Misclassification rate, True positive rate, and True negative rate. Present a ROC curve based on this. (8+7=15)
4. (a) Illustrate the working of  $k$ -means clustering  
(b) What are the popular distance measures used in  $k$ -means clustering?  
(c) What are the advantages and disadvantages of  $k$ -means clustering? (7+4+4)
5. What is Support Vector Machine? Explain with proper example. What is kernel trick? (5+5+5=15)
6. Give a graphical representation on splitting criteria for decision tree with a brief explanation. Also present how Gini-index is computed for categorical attributes. (4+5+6=15)
7. What is a perceptron learning model? Propose a 3-layer neural network model with justified elaboration. (6+9=15)

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