



B.M.S. COLLEGE OF ENGINEERING, BANGALORE-19
(Autonomous Institute, Affiliated to VTU)
Department Name: Computer Science and Engineering

Course Code: 20CS6PCMAL		Course Title: MACHINE LEARNING
Semester : 6	Maximum Marks : 40	Date : 07-07-2022
Internals - II		
Instructions: C choice is provided in Part C		

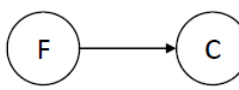
PART-A

Total 5 Marks (No choice)

Q.No	Question	Marks
1	Analyze the differences between Gibbs algorithm and Bayesian optimal classifier? Write error functions of both	5M

PART-B

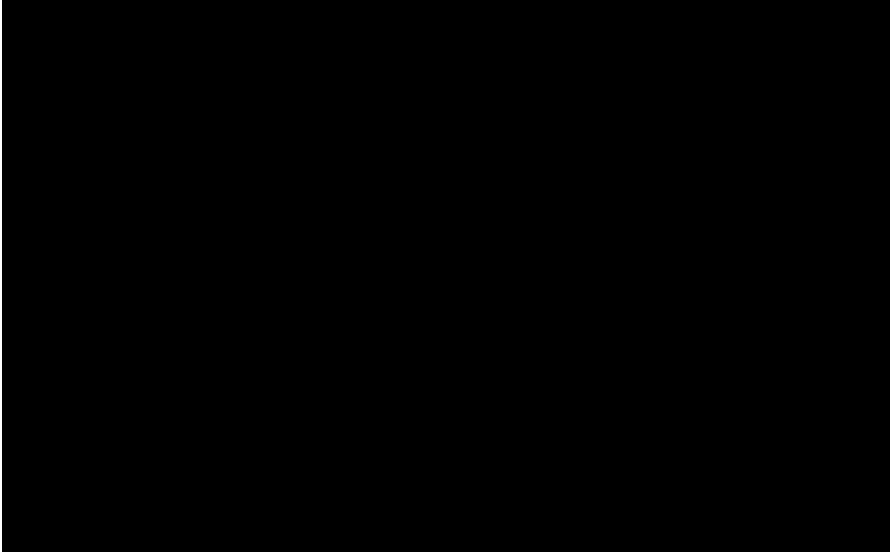
Total 5 Marks (No choice)

Q.No	Questions	Marks
2a	As you know, Covid -19 tests are common now a days, but some results of test are not true. Let's assume, a diagnostic test has 99% accuracy and 60% of all people have Covid-19. If a patient tests positive what is the probability (MAP) that they actually have the disease?	5M
2b	Consider a learned hypothesis, h , for some Boolean concept. When ' h ' is tested on a set of 100 examples, it classifies 83 correctly. What is the standard deviation and 95% confidence interval for the true error rate for $Error_D(h)$	5M
2c	Consider the following Bayesian network, where F = having the flu and C = coughing: $P(F) = 0.1$  $P(C F) = 0.8$ $P(C \neg F) = 0.3$ Write down the joint probability table specified by the Bayesian network.	5M

PART-C

Total 20 Marks (Choice is there)

Q.No	Questions	Marks																																																																		
3a	<p>Consider a problem of different conditions that are associated with accidents. The target variable accident is a binary categorical variable. Build naive bayes model to predict if an accident will happen given a new instance?</p> <table><tr><th>SNo.</th><th>Weather condition</th><th>Road condition</th><th>Traffic condition</th><th>Engine problem</th><th>Accident</th></tr><tr><td>1</td><td>Rain</td><td>bad</td><td>high</td><td>no</td><td>yes</td></tr><tr><td>2</td><td>snow</td><td>average</td><td>normal</td><td>yes</td><td>yes</td></tr><tr><td>3</td><td>clear</td><td>bad</td><td>light</td><td>no</td><td>no</td></tr><tr><td>4</td><td>clear</td><td>good</td><td>light</td><td>yes</td><td>yes</td></tr><tr><td>5</td><td>snow</td><td>good</td><td>normal</td><td>no</td><td>no</td></tr><tr><td>6</td><td>rain</td><td>average</td><td>light</td><td>no</td><td>no</td></tr><tr><td>7</td><td>rain</td><td>good</td><td>normal</td><td>no</td><td>no</td></tr><tr><td>8</td><td>snow</td><td>bad</td><td>high</td><td>no</td><td>yes</td></tr><tr><td>9</td><td>clear</td><td>good</td><td>high</td><td>yes</td><td>no</td></tr><tr><td>10</td><td>clear</td><td>bad</td><td>high</td><td>yes</td><td>yes</td></tr></table> <p>New instance to classify is: <Weather condition: rain, Road condition: good, Traffic condition: normal, Engine problem: no></p>	SNo.	Weather condition	Road condition	Traffic condition	Engine problem	Accident	1	Rain	bad	high	no	yes	2	snow	average	normal	yes	yes	3	clear	bad	light	no	no	4	clear	good	light	yes	yes	5	snow	good	normal	no	no	6	rain	average	light	no	no	7	rain	good	normal	no	no	8	snow	bad	high	no	yes	9	clear	good	high	yes	no	10	clear	bad	high	yes	yes	10M
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OR		
3b	Prove that every consistent hypothesis is a MAP (maximum a posteriori) hypothesis. Use a posterior probability of each hypothesis given observed training data D. Design a Concept Learning algorithm to output the MAP hypothesis, based on Bayes theorem	10M
4a	<p>Considering below dataset and hypothesis, discuss how Minimum Description Length (MDL) principle applied in the machine learning to select best hypothesis which compresses the dataset with minimum MDL</p> <p>H1: [Play :Yes] If {outlook=overcast} If { humidity=normal, wind=weak}</p> <p>H2: [Play :Yes] If {outlook =overcast} If { humidity =normal, wind =weak} If{ temperature =mild, humidity=normal}</p> 	10M
OR		
4b	Estimate the difference between the true errors of two hypothesis h1 and h2. Use the general approach for deriving confidence interval for d. What is the probability distribution governing the random variables. Obtain the approximate variance of each distribution.	10M

Course Outcomes

CO1	Ability to apply the different learning algorithms.
CO2	Ability to analyze the learning techniques for given dataset.
CO3	Ability to design a model using machine learning to solve a problem.
CO4	Ability to conduct practical experiments to solve problems using appropriate machine learning techniques.