COURSE CODE: COCSC17
COURSE TITLE: MACHINE LEARNING

DURATION 1.5 HOUR
Instructions:
MAX MARKS: 15
Assume any missing data
Do not write very long answers, else you may run out of time. Justify wherever required, clearly and to the point.
Number the answers fully (such as A1a-iii)

No	Question	Marks	CO
Q1a	You have started an e-commerce site of general products. You want to deploy the following applications: (i) Planning the inventory (stocks of various products) (ii) Recommend products based on latest trends (iii) From comments about a product, segregate complaints from praise. For each of the above, decide what type of ML approach will work and why?	1.5	CO3
Q1b	Mankind wants to develop a rover for exploring another solar system. Which of the following domains may be relevant and why? NLP, Vision, ML, Robotics, Social Network Analysis.	1.5	CO3
Q2a	The ecological status Y of an area can be *balanced, unbalanced*. It depends upon (i) whether forest area $x1$, is less than or more than 25% of entire land (ii) energy consumption $x2$ is (low, high) (iii) Pollutants in biosphere $x3$, are in (red, green). If I want to predict the ecological status of a new region, (i) suggest the input variables and their possible values (input space) (ii) the form of the hypothesis function (ii) Calculate the hypothesis space size.	1.5	CO2
Q2b	What is the purpose of cross-validation? Given historical data of 100 instances with 20 of them positive and remaining 80 negative, suggest a suitable method for training-testing with cross-validation.	1.5	CO1
Q3a	Fisherman Somu doesn't mind if his catch of surmayi has some rohu, but he does not want to miss any surmayi. His companion Vallabh really doesn't not want rohu to mix up with surmayi, even if he misses on some of them. The following confusion matrices will be suitable for Somu or for Vallabh and why? |	Actual Surmayi	Actual Rohu
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Predicted Surmayi	120	75
Predicted Rohu	5	50		1.5	C23
Q3b	Given training data of 100 GB, using stochastic gradient with 70:30	1.5	CO2

	train test division and 3-fold cross validation.		
	It takes 1 microsecond for each of the following operations (i) Calculate loss function – 10^5 sec (ii) update weights using Delta learning rule – 10^6 sec (iii) calculating output – 10^4 sec. Calculate: (i) training time in hours (ii) testing time in hours (iii) field prediction time for 10 new data		
Q4a	From the Table given below showing regressor "School dropout rate" and response "employment rate" in different states of India, derive the bias and regression coefficient, from the given data.<table><tr><td>State</td><td>School dropout rate</td><td>Employment rate</td></tr><tr><td>Punjab</td><td>40%</td><td>50%</td></tr><tr><td>Kerala</td><td>10%</td><td>93%</td></tr><tr><td>Bihar</td><td>60%</td><td>40%</td></tr><tr><td>Manipur</td><td>2%</td><td>50%</td></tr></table>	1.5	C
Q4b	For an application where fees of higher education is predicted based on faculty strength, faculty research profile, faculty expertise in a given field, salary paid to faculty, and faculty retentivity, which kind of regularization may be use Lasso or Ridge or a combination. Justify.	1.5	
Q5a	For a fixed bias $w_0 = 0$, if the weight w_1 of the single regressor increases by 2 units, by how much will (ii) Odds increase? (iii) Log-odds increase?	1.5	
Q5b	Why stochastic gradient descent / ascent may be better than considering all data points while training?	1.5	