Institute of Information Technology
Jahangirnagar University
2nd Semester M.Sc. in Information and Communication Technology
Final Examination 2022

Course Code. ICT 5405 **Time. 3 Hours**
Course Title. Project Management and Quality Assurance **Marks. 60**

There are seven questions. Answer any five of them.
Figures in the right margin indicate marks.

1. a) Why Scrum is considered as development framework? 4
   b) Mention the challenges we face for software project Managements. How agile help us to overcome these? 4
   c) Agile prefers small teams. Why? As a scrum master how can you motivate your team members? 4

2. a) Illustrate the three fundamental scrum artifacts. 3
   b) The goal of risk management is to recognize hazards and develop strategies to reduce their impact on a project. Explain the risk management process for a project. 4
   c) For first 4 sprints of agile project if the team's velocity was 15 points, 16 points, 19 points and 22 points then find the average velocity. If your remaining product backlog contains 800 story points then find how many sprints you need to complete the product backlog? If you have 2 weeks long sprint then find the team's velocity to complete the project in 50 weeks. 5

3. a) Organizations need to make software effort and cost estimates. Explain Algorithmic cost modelling and its challenges. 4
   b) Explain two different versions of reuse model. How one can estimates the development effort using Reuse model. 4
   c) Table 1 showing Tasks, durations and dependencies of a project. Draw an activity chart using today's date as starting date. Find the finish date. 4

Table 1: Task Dependencies

Task	Effort (person-days)	Duration (days)	Dependencies
T1	15	10	
T2	8	15	
T3	20	15	T1 (M1)
T4	5	10	
T5	5	10	T2, T4 (M3)
T6	10	5	T1, T2 (M4)

T7	25	20	T1 (M1)
T8	75	25	T4 (M2)
T9	10	15	T3, T6 (M5)
T10	20	15	T7, T8 (M6)
T11	10	10	T9 (M7)
T12	20	10	T10, T11 (M8)

4. a) What is static metrics? Describe the following static software product metrics : 4
   i) Fan-in/Fan-out
   ii) Length of code
   iii) Length of identifiers
   iv) Fog index

   b) Continuous integration is one of the factors for the popularity of Agile. How agile builds are integrated as daily builds? 4

   c) The configuration management of a software system product involves four closely related activities. Explain those four activities with figure. 4

5. a) Write down McCall's quality factors with definition. 4

   b) Suppose for any system mean-time-to-failure is 200 and mean-time-to-repair is 100 time units. Find the mean-lime-between-failure (MTBF), and availability of the product. 3

   c) Software quality metrics focus on the quality aspects of the product, process, and project. Explain the product quality metrics. 3

   d) Suppose there are 120 licensed copies of any application that has installed within 1.5 months. Customers has reported 873 problems (true defect and non-defect oriented problems) during this period. Find PUM. 2

6. a) Errors are the main cause of poor software quality. It is important to look for the cause of error and identify ways in which to prevent these errors in the future. Illustrate four popular causes of errors. 4

   b) A business model describes the rationale of how an organization creates, delivers, and captures value. Mention the attributes or factors of business model. 4

   c) Why test estimation is important? Find the test case point from the following table. To complete the testing within 21 person months how many TCPs should be done in a month? What would be total cost if monthly cost is 50,000/- 4

Test Case Complexity	Number of Test Case	Adjustment Factor
Simple	50	1
Average	30	2
Complex	20	3

7. a) Illustrate Business Process Reengineering (BPR) model with figure. 4

   b) Process change involves making modifications to existing processes and introducing new practices, methods. Explain the stages of process change. 4

   c) Explain reverse engineering and forward engineering 4

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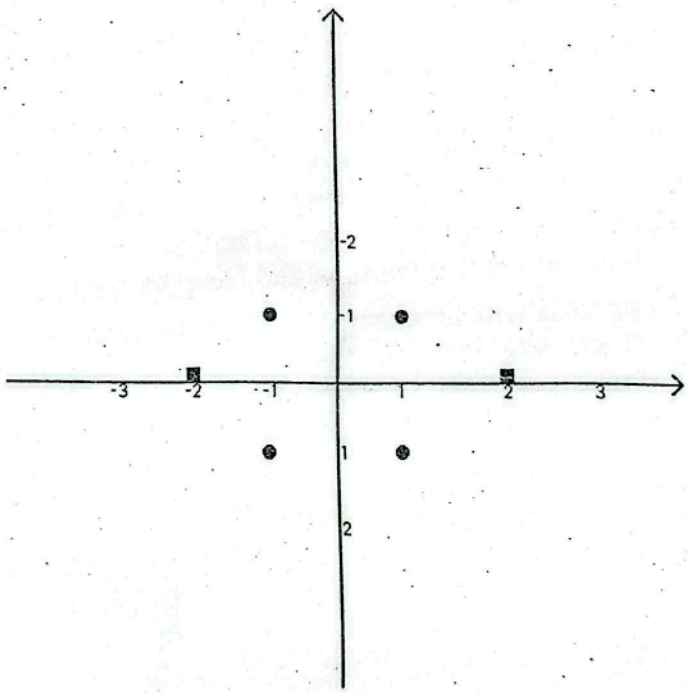
Course Code: ICT-5402, **Course Title:** Advanced Machine Learning

Total Marks: 60 **Time:** 03 Hours

Answer any **five (5)** of the following questions. Figures at the right indicate the marks.

1. a) Illustrate the application of machine learning in automatic speech recognition. 3
   b) "Reinforcement learning can be utilized to improve game playing" – explain. 3
   c) If your model performs great on the training data but generalizes poorly to new instances, what is happening? Suggest three possible solutions. 3
   d) Give some real-life example of unsupervised machine learning is being used now-a-days. 3

2. a) What is support vector machine? 2
   b) What are the limitations of SVM? 4
   c) Find the hyper plane using nonlinear SVM of the following graph of two feature values. What will be the prediction of (-2,2) and (0,1)? 6



3. a) Justify the reasons behind using different cost functions during training than the performance measure used for testing. 3
   b) When should you use plain Linear Regression (i.e., without any regularization), Ridge, Lasso, or Elastic Net? 3
   c) Can Gradient Descent get stuck in a local minimum when training a Logistic Regression model? 3
   d) Suppose, you want to classify pictures as outdoor/indoor and daytime/nighttime. Should you implement two Logistic Regression classifiers or one Softmax Regression classifier? 3

4. a) Assume that you have trained five different models on the same training data, and they all achieve 80% accuracy. Is there any chance that you can combine these models to get better results? Justify your answer. 3
   b) Illustrate the working process of the stacked generalization ensemble method. 3
   c) What is the benefit of out-of-bag evaluation? Describe the process. 3
   d) If your AdaBoost ensemble underfits the training data, what hyperparameters should you tweak and how? 3

5. a) "Clustering can be used for image segmentation, pre-processing, and semi-supervised learning" – explain. 5
   b) Cluster the following eight points into three clusters: P1 (2, 10), P2 (2, 5), P3 (8, 4), P4 (5, 8), P5 (7, 5), P6(6, 4), P7 (1, 2), and P8 (4, 9). Initial cluster centers are P1, P4, and P7. Use the K-means clustering algorithm to find the three cluster centers after the second iteration. 4
   c) Choosing the optimal number of clusters is a big task in the K-means clustering algorithm. How can you choose the value of K? 3

6. a) What are the main motivations for reducing a dataset's dimensionality? Once a dataset's dimensionality has been reduced, is it possible to reverse the operation? 4
   b) In what cases would you use Incremental PCA, Randomized PCA, or Kernel PCA? Does it make any advantages to chain two different dimensionality reduction algorithms? 4
   c) We want to draw from the following distribution 4

$$p_i = \begin{cases} 0.3 & i = 1 \\ 0.2 & i = 2 \\ 0.5 & i = 3 \end{cases}$$

MCMC method has certain advantages and disadvantages over other methods for generating random variates. Give an advantage and a disadvantage of the metropolis hasting Algorithm over the acceptance-rejection method?

7. a) Distinguish between reinforcement learning and Deep learning 6
   b) Discuss deep CNN process with an example and illustrations 6