## PART A. [40 marks]

In the following questions choose one correct answers.

b 1. A decision support system (DSS) is used by
  - a. Workers
  - b. Senior Managers
  - c. Middle Managers
  - d. Executives

d 2. Which of the following best describes the reason why projects fail?
  - a. Technological problems
  - b. System is too complex
  - c. Wrong development methodology
  - d. Undefined project management practices

C 3. Which of the following is not an UML?
  - a. Use case diagram
  - b. Class diagram
  - c. Entity relationship diagram
  - d. Activity diagram

b 4. When DFD fragment 3 is decomposed with 4 processes, the 4 processes are numbered as processes _____, respectively.
  - a. 1, 2, 3, and 4
  - b. 3.1, 3.2, 3.3, and 3.4
  - c. I, II, III, and IV
  - d. f3.1, f3.2, f3.3, and f3.4

C 5. Which is NOT a criterion that is used to determine how to define tasks for a work breakdown structure.
  - a. How to know when the task is complete.
  - b. How to estimate the effort required.
  - c. A logical way to determine its predecessor.
  - d. It should take one to five days.

b 6. "Customer decides to buy a shirt" is an example of what?
  - a. An external event
  - b. Activity prior to an event
  - c. A temporal event
  - d. Activity after an event.

C a 7. One way to show multiple, independent alternative paths within an activity diagram is with a _____.
  - a. synchronization bar
  - b. swimlane
  - c. decision diamond
  - d. activity oval

d 8. Workflows can be documented using _____.
  - a. swimlanes
  - b. use case diagrams
  - c. class diagrams
  - d. activity diagrams

d 9. An important step in using the CRUD technique is to _____.
  - a. identify the system controls
  - b. identify the external agents
  - c. identify the business events
  - d. identify the data entities

C 10. The number of associations that occur among specific things in a domain class diagram is called ____.
  - a. a relationship
  - b. an attribution
  - c. multiplicity
  - d. cardinality

a 11. The association shown on the following image is a(n) _____ association.

0..*	0..*
Customer	
name mobilePhone homePhone emailAddress status	
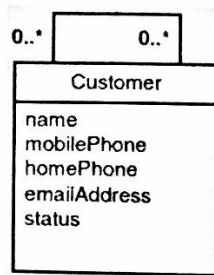
a. Unary
b. Binary

c. n-ary
d. Undefined

C 12. Which of the following relationships would be the most appropriate way to describe a relationship between an employee and his/her manager?
   a. Composition relationship
   b. Aggregation relationship
   c. Generalization/Specialization relationship
   d. Association relationship

d 13. System development lifecycle (SDLC) provides structures, methods, controls and checklist. Which of the following is the structure in SDLC?
   a. Data structure
   b. Logical structure

   c. Mathematical structure
   d. Team structure

C 14. Which of the following does not belong to a system development lifecycle (SDLC)?
   a. Deployment phase
   b. Project initiation phase

   c. Support phase
   d. Implementation phase

a 15. An approach to the SDLC where the phases overlap is often referred to as the _____ approach.
   a. modified waterfall
   b. waterfall

   c. modified predictive
   d. spiral

In the following questions choose multiple correct answers.

ae 1. The "+" in FURPS+ includes which of the following types of requirements? (choose two)
   a. Supportability requirements
   b. Performance constraints
   c. Reliability constraints
   d. Nonfunctional requirements
   e. Design constraints
   f. User interface requirements

ad 2. Two primary techniques to identify use cases are _____ and _____. (choose two)
   a. user goal technique
   b. CRUD technique
   c. system response technique
   d. event decomposition technique
   e. business function technique
   f. user procedure technique

abe 3. Which three of the following components describe locations and communication through networks?
   a. Location diagram
   b. Activity-location matrix
   c. Activity diagram
   d. Black hole
   e. Activity-data matrix
   f. Use case diagram

abe 4. Which three of the following models are adaptive models in SDLC? (choose three)
   a. Spiral model
   b. Phased development model
   c. Modified waterfall model
   d. Waterfall model
   e. Prototyping model
   f. Parallel Model

ad 5. Which two of the followings are function requirements?
   a. Generate a list of customers
   b. Efficient and Reliable
   c. User-interface should be clear
   d. Send monthly report

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PART B. [15 marks]

B1. (5 marks) Data flow diagrams (DFDs) have 5 symbols. Draw and briefly explain each of them
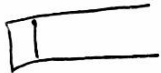
Process

Data flow

External Agent

Data store

Real-time link

B2. (5 marks) List three types of events and brief descriptions for each.

External Event : Occurs outside of the system

Temporal Event : Occurs as a result of reaching
a point in time (Based on deadlines)

State (Internal Event): Occurs when something happens
inside the system that triggers
some process

B3.   (5 marks)

(1) List three methods to describe processes in DFDs. (3 marks)

Structured English

Decision table

Decision tree

(2) If the decision logic is complex, which method(s) would you choose? (2 marks)

Decision table

Decision tree

PART C. [45 marks]

C1. (15 marks) Given the following project activities and duration information of each task. Assume that the tasks will start as soon as possible.

Task Name	ID	Immediate Predecessors	Duration (in days)
Collect requirements	A		2
Create reports	B	A	4
Analyze requirements	C	A	5
Design processes	D	B, C	3
Design data	E	C, D	5
Design GUI	F	D	4
Program	G	E, F	6
Test and install	H	F, G	3

(1) Use a PERT/CPM chart to schedule the tasks. (9 marks)
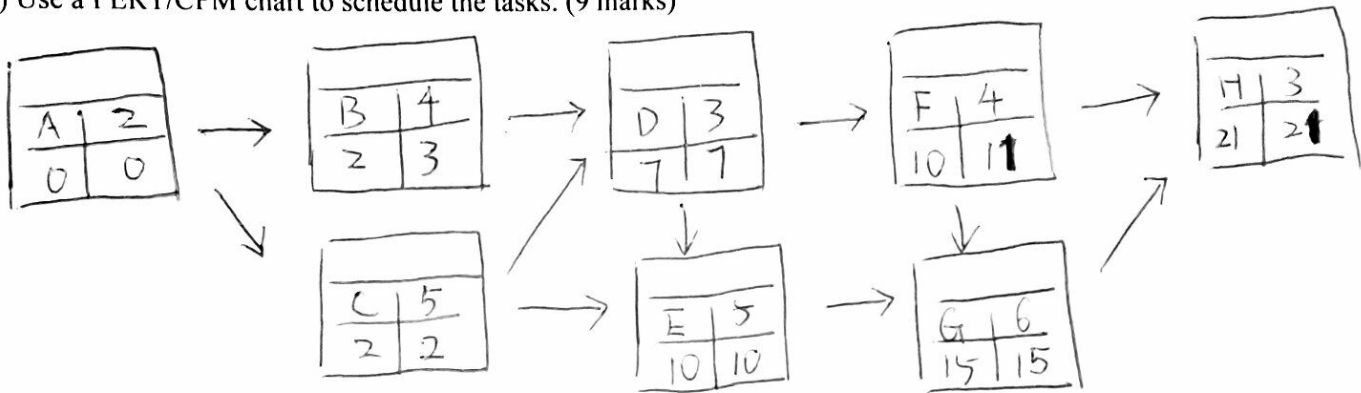
(2) What is the total duration of the project? (2 marks)

24 days

(3) What is the critical path? Please specify the Task IDs on the critical path sequentially. (4 marks)

A C D E G H

C2. (15 marks) The one-time cost for developing an Information system is 10000. The costs for maintaining the system are 900, 1000, 1000, 1100, and 1100 a year. The benefits of the system from year 1 to year 5 are 4000, 4100, 4200, 4300, and 4400. Suppose the discount interest rate is 10%. (During the calculation, round the numbers to two decimal places in each step)

(1) Calculate the net present value of each year. (6 marks)

	Year 1	Year 2	Year 3	Year 4	Year 5
Net benefit/costs = Benefit − Cost	3100	3100	3200	3200	3300
Discount Factor = $\frac{1}{(1+\text{Interest Rate})^n}$	0.91	0.83	0.75	0.68	0.62
NPV = (Net benefit/cost) * Discount Factor	2821	2573	2400	2176	2046

(2) When is the break-even point? (6 marks)

Cumulative NPV
Year 0   −10000
Year 1   −10000 + 2821 = −7179
Year 2   −7179 + 2573 = −4606
Year 3   −4606 + 2400 = −2206
Year 4   −2206 + 2176 = −30
Year 5   −30 + 2046 = 2016

The break-even point is 4 years 5 days.

30/2046 * 365 ≈ 5

(3) Calculate return on investment with discount. (3 marks)

$$\frac{\text{sum of NPV}}{\text{development cost}} = 120.16\%$$

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C3. (15 marks) Construct an ERD for a car rental company. It opened multiple stores across Canada. Each store has multiple cars for rent. Each rental car can have one or more registered drivers. For each car we also want to model the odometer (distance travelled). Please add any additional attributes that might be necessary in this diagram.

Store

Address
Store ID – PK

Car

Odometer
Car ID – PK
Make
Color

Driver

License ID – PK
Age
Gender
Name

(Store |——<E Car |——<E Driver)