Question 1 [12 Marks]

Show whether each of the following statement is true or false. Correct the false statements. (Provide reasonable explanation):

a) The software Engineering is different from other mechanical and electrical engineering activities.
True, the software program is intangible and unique.

b) The SSD (System Sequence Diagram) can be used to correct or enhance the class model of the system.
False the correction is the SD sequence diagram not SSD

c) A use case diagram shows the details of each use-case
False the use case description instead

d) In DFD each process is described by an action verb
True because it is an action done on the data

e) An SRS document is created by the customer.
False No created by the developer company in the presence of the customer

f) Stakeholders' requirements can be gathered using workshops or interviews.
True

g) The associations between classes in the class model shape show the dynamic behavior of the software application.
False shape the static behavior

h) A state-chart is less suitable than state transition diagram in complex systems.
False. Complex systems its states are complicated so better to use state charts

i) A transition between states is fired by actions.
False by triggers

j) A Stakeholder is a person who is going to use the software application.
False this is the role of the actor

k) Activity diagrams only can be used in database oriented applications
False it is a general diagram DFD and ER are more suitable for database applications

l) In a DFD, the arrows carry strong (action) verbs.
False carry data item names

Question 2 [21 Marks]

The following is a general description of video rental system (VRS):

The VRS allows customers to search the video inventory provided by this video store. To rent videos through the VRS, one must register as a member using the VRS. Upon becoming a member and logging into the VRS, the VRS provides the functionality for renting videos, modifying membership information, and paying overdue fines.

The clerks of the video store use VRS to process the return of rented videos. The owner of the video store uses VRS to add new videos into the system, remove videos from the system, and modify video information.

The VRS sends emails to members concerning video rentals. One day before a rented video is due to be returned, VRS emails the member a reminder of the due date for the video(s). For any overdue videos, VRS emails the member every 3rd day with overdue notices. At the 60-day limit for outstanding videos, VRS debits the member's credit card with the appropriate charge and notifies the member of this charge.

a) Draw a complete use-case diagram with all relevant actors and use-cases. ***[4 marks]***

Actor: user
Use cases
- ***Browse videos***
- ***Become a member***

Actor: Member
Use cases
- ***Rent video***
- ***Browse video list***
- ***Pay fine***

Actor: Operator
Use cases
- ***Return video***
- ***Add video***
- ***Modify video***

Actor: Manager
Use cases
- ***Show report***

b) List all possible sources and ways for Requirements gathering and elicitation for the VRS system. ***[3 marks]***

- ***Workshop***
- ***Interview with the company operators***
- ***Questionnaire sent to the clients***

c) Show a use case description for renting of a video by an existing member, add all data needed like post-, pre-conditions, actor names, trigger, etc. ***[3 marks]***

Use case : rent a video
Actor: member
Precondition: member has a video in hand applicable for rent
Post condition: the member has the video and this is reflected in the database
Trigger: the member wanted to rent a video
Course:
1- Member take the video to the operator
2- System identifies the video
3- System displays the price and video details and return date
4- Member confirms
5- System updates the information

d) Show the corresponding activity diagram for part (c). ***[3 marks]***
This is a normal flowchart possible adding whether the member has fines to pay

e) Draw DFD diagram level 1. ***[5 marks]***
The processes would be :

- ***Browse videos***
- ***Become a member***
- ***Rent video***
- ***Browse video list***
- ***Pay fine***
- ***Return video***
- ***Add video***
- ***Modify video***
- ***Show report***

f) Draw a CRUD matrix between the process of the DFD level 1 and Data item (data stores), comment on any incomplete findings ***[3 marks]***

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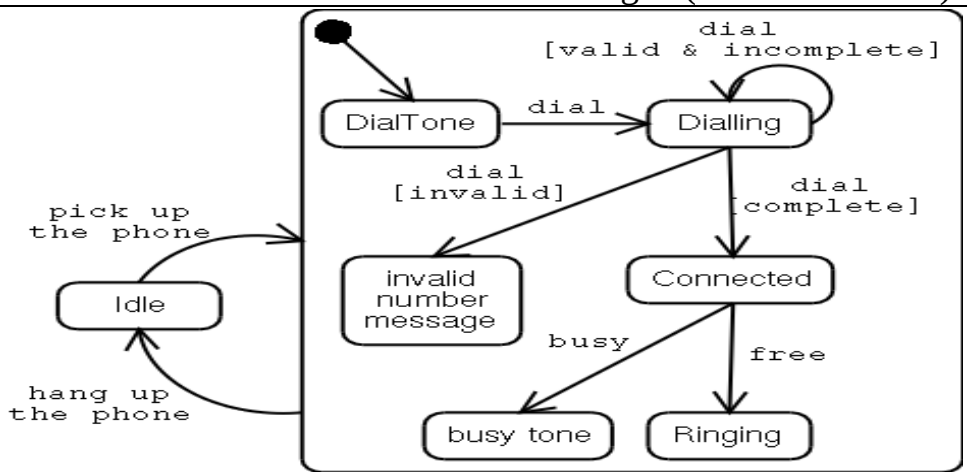
Process/ data items	member	video	Video copy
Browse videos		R	
Become a member	C		
Rent video	R	R	C
Browse video list		R	
Pay fine	U		
Return video	R	R	D
Add video		C/U	C*
Modify video		U	C*
Show report	R	R	R

Question 3 [12 Marks]

Following is a state chart for developing a software application for a telephone system. The initial state is Idle. Consider all numbers to be 8 digits (i.e. 8 dial events)



a) Provide an event list in the form of (event 1→ event 2→ event 3) to reach state ringing. ***[12 Marks]***

Pickup the phone-> dial(8)->free

b) Starting from state Ringing is state "invalid number message" reachable? and if so what is the minimum number of events needed to reach this state? ***[12 Marks]***
Hang up the phone-> pick up the phone->dial(*)
Minimum is 4 events

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c) Modify the state chart to provide "time out" when the phone is hanged for one minute before the dialing is complete. When this happens the control returns to state dialTone. ***[12 Marks]***
Would have a new variable called time that is initialized when we pickup the phone and if the dialing is not completed the control will force us to go to state hang up

Question 4 [25 Marks]

A logistics company provides international express mail services. The client of this company can send a document from one country to another. Each shipment has one of three categories which differ in the expected delivery time and service fees. The company needs to automate its business. The clients can track their shipments from the time they issue the request all the way to the time the shipments get delivered. There will be a webpage where the client apply for shipment request, send feedback or track the active shipments. Other part of the software (at the server side) should deal with the company supplied information and provide reports to the management of the total shipments statistics.

a) List four possible stakeholders. **[2 Marks]**
Owner, client, delivery operator, admin

b) Write down six functional requirements and four non-functional requirements. **[5 Marks]**
- Parcels must be tracked
- Client can request to send parcels
- Parcels will be delivered on time
- Client can update his/her information
- Client can delete the request before picking the parcel
- Owner can list the statistics reports

Non functional
- Client privacy is maintained
- Access control on the system data
- Customer must pay for the service
- Scalability of the system with number of online users and parcels

c) Trace each requirements in (b) to a stakeholder in (a) **[4 Marks]**
- Parcels must be tracked [client, owner]
- Client can request to send parcels [client]

- Parcels will be delivered on time [client]
- Client update his/her information [client]
- Client delete the request before picking the parcel [client]
- Owner list the statistics reports [owner]
- Operator register the delivery of parcels [delivery operator]

Non functional [the whole system]

- Client privacy is maintained
- Access control on the system data
- Customer must pay for the service
- Scalability of the system with number of online users and parcels

d) Create a suitable class model showing all relevant classes and associations between classes. **[4 marks]**
The classes must be requests, clients, operators
Each request belong to one client

e) Based on part (d) Show three sequence diagrams for creating a new request for a shipment. Adding new client, and tracing a given shipment. **[6 Marks]**

f) What changes needed to do in the class model to develop the sequence diagram. **[4 Marks]**
Add new class for user interface
Ass new class for dealing with clients
Add new class to search for parcel request

GOOD LUCK

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