Read the case study and answer ALL questions

Type in your answer. Last column is for the tutor's marks.

QUESTION 1   **Total :**

No	Student Answer	Marks
a(i)	 *Notes: will need to zoom in in order to see the PERT Chart.*	
a(ii)	The duration to complete the project in weeks : 2+3+4+5+6+3+3+2 = 28 weeks	
a(iii)	The critical path is a linked chain task that will affect the project completion time directly. It includes the total amount of time necessary to complete a project which is addition for the times for the activities and determining the longest path. Critical path : Activity A & B & D & F & G & H & I & J (28 weeks)	
b(i)	Total investment cost = 18000 + 3000 + 1500 + 9000 + 3000 = 34500 Benefit for year 1: 18500 Benefit for year 2: 19500 Benefit for year 3: 20000 ● The payback period is the duration/time taken to payback or break even the initial investment. ● In this case, the payback period is in year 2 because year 1 (18500) + year 2 (19500) = 38000 as you can already exceed the total investment cost which is 34500.	
b(ii)	<table><tr><th>Year</th><th>Project cash flow (RM)</th><th>Discount factor: 12%</th><th>Discounted Cash Flow (RM)</th></tr><tr><td>0</td><td>34500</td><td>1.0000</td><td>-34500.00</td></tr><tr><td>1</td><td>18500</td><td>0.8929</td><td>16518.65</td></tr><tr><td>2</td><td>19500</td><td>0.7972</td><td>15545.40</td></tr><tr><td>3</td><td>20000</td><td>0.7118</td><td>14236.00</td></tr></table>	

	Net Profit : 23500		NPV : 11800.05	

b(iii)	ROI = (11800.05/34500) * 100 = 34.2%	

b(iv)	Yes, the project is beneficial to be carried out because : ● The net present value (NPV) is positive as you see RM11800.50 ● The return on investment (ROI) is also positive as you can see 34.2%.	

QUESTION 2   **Total :**

a	The 3 activities that should be carried out by the quality team are quality assurance, quality planning and quality control.
	
	 ● **Quality Assurance (QA)**
	    ○ It is an activity to develop a framework of organizational procedures and standards that can produce a high quality software
	    ○ It establish the infrastructure that supports solid software engineering methods, rational project management and quality control actions
	
	 ● **Quality Planning (QP)**
	    ○ It is an activity which selects the suitable procedures and standards from the framework in QA and uses it for a specific software project.
	    ○ Normally an organization will create the quality plan that specifies the product quality and how they can be assessed as well as determine the most significant/important quality attributes.
	    ○ The quality plan includes product introduction, product plans, process description, quality goals and risks and risks management.
	
	 ● **Quality Control (QC)**
	    ○ It refers to monitoring the execution of processes to ensure that the software development follows the quality procedures and standards.
	    ○ The deliverables in the software development process can be checked from the predefined project standards using the quality reviews for find out and correct the problem discovered and automated software assessment.	

b(i)	**Portability**
	 ● Example : *Adaptability*
	    ○ It refers to the ability of a system to effectively and efficiently adapt itself to different hardware, software or other operational or usage environments.
	    ○ For example,we can monitor the functionality of the appointment and service system on different platforms (i.e hardware and software).	

  ○ The system shall be able to perform its functionality under different environments.

Reliability
- Reliability refers to the ability of the system to perform the specified system without failure for a specified period of time.
- Example : ***Mean time to failure (MTTF)*** refers to the average duration for the appointment and service system to operate before failure occurs. The predicted elapsed time between inherent failures of the system during normal bill payment operation. It could be measured by applying this formula:
  - MTTF = Total hours of operation / Total number of units
- The result of MTTF should be longer than the transaction length. It can be used to predict when the component is likely to fail and fix it before the failure occurs thus can reduce repair cost and minimize system downtime.

Maintainability
- Maintainability relates to the ease and time/ efforts taken which the cause of an error can be diagnosed and then be fixed by developers.
- Example : we can calculate the ***mean time to repair (MTTR)*** of the appointment and service system to know the duration needed to identify and fix the bugs. If the time and resources taken are long, it means that the system has low maintainability and we should improve it by creating a well-written documentation, purchasing similar equipment to ensure compatibility, etc.

b(ii)	**Potential challenges to the portability**	
	● If the system has low portability, it might cause the system to be not compatible and adaptable when mitigated to a new version or new hardware and software component and environment which will directly cause the system failure and eventually project failure as it cannot function properly.	
	Potential challenges to the reliability	
	● If a system is not reliable, it might cause catastrophic consequences if system failure happens as it is not able to provide error detection and recovery mechanisms.	
	● The system will become not fault tolerant in which a system fault might have a high possibility to cause system error, and even worse system failure which causes project failure as the developer team needs to spend more time to solve the issue and might cause budget overrun.	
	Potential challenges to the maintainability	
	● If we did not achieve the maintainability of the system, it might cause the project to suffer project overrun as the low maintainability means the we will need more time and more effort to diagnose the error and fix the bugs arised, in which it will cause more maintenance cost to be incurred and eventually cause project failure as the budget is more than cost estimation during project planning.	

QUESTION 3   **Total :**

a(i)	● Yes, I think the financial risk and technology risk will negatively affect the website project implementation at First Automobile Sdn. Bhd.	
	● For financial risk, for example if the actual cost for a project exceeds the cost estimation that might be caused by a low quality hardware that has been broken, it will require extra repair cost to replace the broken hardware. This might cause the stakeholder to feel unsatisfied as they have to spend more capital on the software component maintenance.	
	● Furthermore, if the stakeholder refuses to provide capital to support the project implementation in First Automobile Sdn. Bhd., it might cause the project to be delayed and the project might not be completed on time as the project manager needs to find another sponsor to provide financial support in order to ensure the project can continue to develop.	
	● Therefore, we need to mitigate the financial risk so that the project development can be completed on time and within the budget so that it won't affect the website project implementation badly.	
	● For the technology risk, if the security breach happens and exposure of customer data happens, the customer will lose confidence if the appointment	

		and service system failed to provide adequate security to protect their privacy data and might switch to another car service centre. ● Furthermore, if the power outage happens and causes system down time, the customer will feel unsatisfied as the appointment and service system is not available (24x7) for them to use, they may turn to another car service centre to service their car ● Therefore, we need to mitigate the technology risk so that the project can be technically feasible and produce a useful software product which would not affect the website project implementation badly.	
a(ii)		● I agree with this statement. ● This is because the covid pandemic has appeared since 2019, and all the businesses started to be affected by the covid pandemic at that time. In 2019, they might don't know how to mitigate the financial risk such as cash flow liquidity risk, loss of capital due to losing support from stakeholder, etc as they do not have any experience to handle this kind of risk. ● But now is 2021, it has been 3 years since covid happened and the business organization will now know how to mitigate the financial risk as they have experienced before, they know what to do to reduce the impact of financial risk. ● For example, the organization can establish a contingency plan to overcome this risk (i.e find a backup sponsor to provide adequate financial support to ensure the software development can be continued as usual). ● Moreover, the organization can monitor the budget at completion (BAC) for each deliverables/tasks to ensure the project is within budget, if the budget overrun, the project manager will need to determine which corrective action to solve the budget issue such as re-planning the project.	
b.		2 examples of resistance to change that might occur for the web site project implementation at First Automobile Sdn. Bhd : ● The **project manager may resist the process change** because it will cause project uncertainty and introduce unknown risk to the project schedule, quality and cost. This is because the project manager will often revise the project plan and judge according to the time and budget (i.e from earned value analysis report) to ensure the project can be completed on time. Hence, they might prefer an inefficient but predictable process instead of the unknown risks associated with the improved process as they might cause projects to be delayed and budget overrun. ● The **software engineer may resist the process change** as this will threaten their professionalism. To illustrate, they might be afraid that they do not know how to complete the project using the new predefined process, in which it gives them less discretion as well as it does not recognize the value of their skills and experience.	

c.	THREE (3) factors that should be considered when carrying out software process improvement : ● **Company's size** - it should be considered the company size of the First Automobile Sdn. Bhd such as is it a small or medium or large enterprise. In this case, the Automobile Sdn. Bhd can be considered as a medium enterprise as it has few service centre branches in other states of Malaysia. ● **Staff's background and skills** – It should consider the overall staff technical skills, knowledge and project experience of the appointment and service system's project team. In this case, the project is formed which includes existing employees of the company, senior system analyst and there are development teams, a testing team and a quality team in this project. ● **Type of software being developed** - It should be considered whether the system developed is a critical or non-critical software and whether it is an online-based or web-based system. In this case, the project is a business critical system and it is an online-based system which allows authenticated user to perform the functions over the network.	

QUESTION 4   **Total :**

a	A configuration management is concerned with the policies, processes and tools that are needed to manage the change request for the software. 2 Purposes: ● Control changes are needed for the team projects to control and keep track the changes made by different developers so that the change is traceable to avoid losing track of what changes and component versions have been incorporated into the system version. ● To provide secure storage in order to protect all the software components, for example, it can provide access control to each version of software components to avoid unauthorized access and theft.	
b	 ● The 2 types of version control system that can be applied to the project at First Automobile Sdn. Bhd. is *centralized version control system* and *distributed control system* ● For a centralized VC system, there will only be a single master repository to maintain all the versions of software components that are being developed while for the distributed VC system, there will be multiple version of the	

	component repository available at the same time. ● For the accessibility criteria, the authorized user such as staff can access the central repository over the internet in a centralized VC system while for the distributed system, the users can access offline. ● There will only be one central repository in the server for a centralized system while for the distributed VC system, each of the users will clone a complete repository which is a local repository to their local machine. ● The example of a centralized VC system is Subversion and the example for distributed VC system is Git.
c.	The type of critical system that is associated with the web site project implementation at First Automobile Sdn. Bhd is **Business critical system**. ● The appointment and service system is used to provide business services for the customers to make appointments to service their cars in which it allows them to cancel and make payment using digital methods, login to check the service status. ● This is all considered as business activities in which the failure of these activities will cause the appointment and service system to be failed and business failure to the First Automobile Sdn. Bhd. ● To illustrate, if there are high request (i.e appointment requests) from the customer's side which cause a high volume of network traffic and cause the system downtime, if the appointment and service system cannot handle such volume of customer request, it will cause customer satisfaction as the system is not available for them when they want to use, in result, the First Automobile Sdn. Bhd will lose its customer and the customers will switch to another car service centre to service their car.

d.	**3 Security dimensions :**
	
	● **Confidentiality**
	  ○ The information in the appointment and service system shall be disclosed and made accessible to the authorized user.
	  ○ For example, after the user has a key in the correct user ID and password, they can perform the functions such as check their service details and status, otherwise, the user will not be able to log into the system to check the services status. All of the service details and status will only be accessible to the authorized user based on their id and password provided.
	  ○ Moreover, their confidentiality of the privacy information such as contact number, password, credit card number will be protected and secured (i.e encrypt the password) and will not be exposed to the other person.

- **Integrity**
  - The information in the appointment and service system shall only be able to be modified or changed by the authorized user.
  - For example, if the data integrity has been compromised such as the total payment has been modified by unauthorized users from RM 200 to RM2000, it will cause customer dissatisfaction and loss confidence in services provided by the First Automobile Sdn. Bhd.
  - Moreover, the customer feedback provided by an authorized user will only be modified by him/her based on the user id, while others only can view the feedback given to the car service.

- **Availability**
  - The appointment and service system shall be made available to the authorized user when they are being requested regardless of the location and time.
  - For example, there should be a backup server for the appointment and service system, in case something happens such as server failure, the backup server can be switched immediately and automatically to continue providing service to the customer.