

Total Marks: \_\_\_\_\_ X 4 = \_\_\_\_\_

Answer all the questions. [Total: 25 marks]

Net Present Value (NPV) is a financial technique used to compare the profitability of different projects. A project manager may use this technique to decide whether a project should be accepted or rejected. Illustrates the cash flow of Project X. The cash flow takes place at the end of each year.

Year	Cash flow
0	-160,000
1	100,000
2	80,000
3	40,000

Calculate the following values for this project, show the workings in your calculation for a) and b).  
 a) Given a 13% discount rate, calculate the Net Present Value for this project. Based on your calculations, does the project have an attractive NPV? Explain your answer.

- Negative value represents cost.

- Discount rate must be rounded up to four decimal places.

NPV and present value round up to the nearest integer.

	Y0	Y1	Y2	Y3	
	-160,000	100,000	80,000	40,000	
Discounted factor	$(1 / (1 + 0.13)^0) = 1$	$(1 / (1 + 0.13)^1) = 0.8850$	$(1 / (1 + 0.13)^2) = 0.7831$	$(1 / (1 + 0.13)^3) = 0.6931$	
Discounted Cost / Benefits	$-160,000 * 1 = -160,000$	$100,000 * 0.8850 = 88,500$	$80,000 * 0.7831 = 62,648$	$40,000 * 0.6931 = 27,724$	18,872
NPV = 18,872					
Based on the NPV (18,872) which is positive so the project is attractive.					

investment (ROI) in percentage, round up to two decimal places.

$$ROI = \frac{\text{Average Annual Profit}}{\text{Total Investment}} \times 100\%$$

$$\begin{aligned}\text{Average Annual Profit} &= \frac{\text{Net Profit}}{\text{Total Year}} \\ &= \frac{-160,000 + 100,000 + 80,000 + 40,000}{3} \\ &= \frac{60,000}{3} \\ &= 20,000\end{aligned}$$

$$ROI = \frac{20,000}{160,000} \times 100\%$$

$$ROI = 12.50\%$$

$$ROI = \frac{NPV}{\Sigma \text{Discounted Cost}} \times 100\%$$

$$\begin{aligned}ROI &= \frac{18,872}{160,000} \times 100\% \\ ROI &= 11.80\%\end{aligned}$$

#### SMSE3153 Software Project Management

#### Test

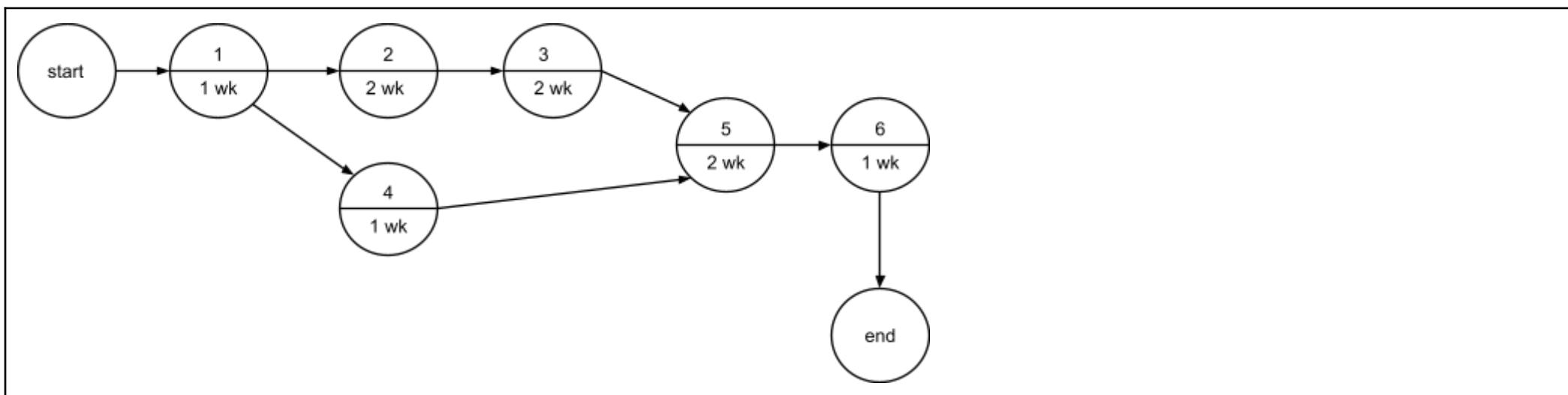
2. Edison Lee is an IT manager working at WinTech University in Kuala Lumpur, has observed that some students have been asking their peers to mark their attendance in previous semesters. To address this issue, he has decided to develop a Fingerprint Detection System (FDS) to accurately record student attendance. Senior management has approved a budget of RM160,000 for the project, which must be completed within three months. The FDS will include three modules: attendance tracking, student management and fingerprint verification. The development team consists of Edison and three software developers: Eva, Eric, and Emily. The project team is required to adhere to quality standards and conduct risk analysis throughout the project.
- What are the TWO (2) constraints of the FDS project? Explain your answer. (6 marks)

A network diagram can be used to illustrate the relationships and dependencies between project tasks. Table 2 shows an example of project tasks, its duration and predecessor.

Table 2: Project tasks, duration and its predecessor

Task ID	Task Name	Duration (in week)	Predecessor
1	Meet stakeholders	1	None
2	Collect requirements	2	1
3	Analysis	2	2
4	Design	1	1
5	Code	2	3, 4
6	Test	1	5

Draw a network diagram based on the task ID, duration and predecessors provided in Table 2. (7 marks)



Based on the answer given in 3.a), identify the project's *critical path* based on the task IDs and dependencies, specify the *total duration* required to complete the project. (2 marks)

Critical Path: 1 -> 2 -> 3 -> 5 -> 6

Total duration required to complete the project =  $1 + 2 + 2 + 2 + 1 = 8$  weeks

ANSWER ALL QUESTIONS

Question 1

- a) Suki is working as a project manager in a software development company in Kuala Lumpur. Her boss, Zamee, has recently assigned her to manage a new software development project that is to develop an E-invoice-System (E-I-S) for a multinational company in Johor. Suki has been told that the project must be completed within 12 months and the allocated budget is RM 300,000. In addition, she will only be assisted by 2 software engineers and 1 tester.

Required:

Explain by giving THREE (3) reasons why the works involved in developing the E-I-S is considered as a project. (note: state any assumption that you may have to support your answer). (6 marks)

- b) Differentiate between project objectives and business objectives. (6 marks)

- c) Net Present Value (NPV) is a common financial technique used by project managers to evaluate and compare the risks and rewards of different projects. This technique helps project managers to decide whether a project is worthwhile to pursue or not. Table 1 illustrates the cash flow of Project E-I-S. The cash flow takes place at the end of each year.

Table 1: Cash Flow of Project E-I-S

Year	Project E-I-S
0	-300,000
1	200,000
2	100,000
3	50,000
4	50,000

Using an 16% discount rate, calculate the NPV for Project E-I-S. Based on your calculations, analyse whether the project is attractive, or it should be rejected. Give reasons for your answer.

Notes:

- Show your workings.
- negative values represent costs.
- Discount factors round up to 4 decimal points. All other figures round up to the nearest integer.

(14 marks)

	Y0	Y1	Y2	Y3	Y4
Cost / Benefit	-300,000	200,000	100,000	50,000	50,000
Discounted Factor	$\frac{1}{(1+0.16)^0} = 1$	$\frac{1}{(1+0.16)^1} = 0.8621$	$\frac{1}{(1+0.16)^2} = 0.7432$	$\frac{1}{(1+0.16)^3} = 0.6407$	$\frac{1}{(1+0.16)^4} = 0.5523$
Discounted Cost / Benefit	$-300,000 * 1$ $= -300,000$	$200,000 * 0.8621$ $= 172,420$	$100,000 * 0.7432$ $= 74,320$	$50,000 * 0.6407$ $= 32,035$	$50,000 * 0.5523$ $= 27,615$
NPV:	$-300,000 + 172,420 + 74,320 + 32,035 + 27,615 = 6,390$				
	<ul style="list-style-type: none"> <li>• The project is attractive as the NPV is positive (6,390)</li> </ul>				

## Question 2

Table 2 shows the status of Project E-I-S. Assuming now the project is in the 8<sup>th</sup> month and as of today, you have paid out RM162,000 to the contractors. Contractors are those who performed the activities shown in Table 2.

Table 2: Status of Project E-I-S

Activity	Estimated Duration (months)	Estimated Cost (RM)	Status (percent completed)
Requirements Gathering	1	20,000	100%
Analysis	1	20,000	100%
Design	1	20,000	100%
Code and test module A	2	40,000	60%
Code and test module B	3	60,000	60%
Code and test module C	4	80,000	40%
Total	12	240,000	-

- a) Based on the information given above calculate:

Note:

You are required to show the steps in your calculations.

- (i) Planned Value (PV) (2 marks)
- (ii) Earned Value (EV) (2 marks)
- (iii) Schedule Variance (SV) (2 marks)
- (iv) Cost Variance (CV) (2 marks)

- b) Based on the results of your calculations in Question 2 a), give a detailed analysis of the overall health of Project E-I-S. (6 marks)

- Good (analysis is complete and correct, student demonstrated good understanding of the concept of Earned Value Analysis/Management): 5-6 marks
- Average (analysis is partially complete and correct): 3-4 marks
- Poor (analysis is weak, unclear and/or irrelevant): 0-2 mark

END .

Current month: month 8

Current paid: RM162,000

$$PV = \Sigma \text{Estimated Cost until current month}$$

$$PV = 20,000 + 20,000 + 20,000 + 40,000 + 60,000 = 160,000$$

$$EV = \Sigma (\text{Estimated Cost} \times \text{Status})$$

$$EV = (20,000 \times 100\%) + (20,000 \times 100\%) + (20,000 \times 100\%) + (40,000 \times 60\%) + (60,000 \times 60\%) + (80,000 \times 40\%)$$

$$EV = 20,000 + 20,000 + 20,000 + 24,000 + 36,000 + 32,000$$

$$EV = 152,600$$

$$SV = EV - PV$$

$$SV = 152,600 - 160,000$$

$$SV = -7,400$$

$$CV = EV - AC$$

$$CV = 152,600 - 162,000$$

$$CV = -9,400$$

The overall health of Project E-I-S is poor as the schedule variance and cost variance both are negative which means that the progress is behind the schedule and cost is exceeded.

Radex Company is the largest bus operator in Malaysia operating in Klang Valley areas. Adam, as an operation manager of Radex has been assigned to develop a Cashless Payment System (CPS) for all its stations. The passengers can select the different payment options to pay the fares using credit cards, debit cards methods, touch n go and boost e-wallets. It reduces the queueing time to purchase tickets at the service counter. A budget of RM 150,000 has been approved for this project. The system scope of CPS focuses on the core feature of the graphical user interface design, payment module and integrates with third payment parties. The formation of the project team consists of six staff from the Information Technology department who will be working on this project.

Answer the following questions based on the given scenario.

### Question 1

- a) Identify and describe TWO (2) stakeholders of the CPS project. (6 marks)
- b) Identify and explain TWO (2) types of prototyping process models commonly used to address uncertain user requirements and adapt to user changes. (6 marks)
- c) A network diagram can be used to illustrate the interdependencies between tasks in a project. Table 1 shows an example of project tasks, its duration and predecessor.

Table 1: Project tasks, duration and its predecessor

Task ID	Task Name	Duration (in weeks)	Predecessor
A	Project planning	1	None
B	Feasibility study	1	A
C	Refine requirements	1	B
D	Design GUI and database	1	C
E	Design a prototype model	2	C
F	Code for core modules	2	D, E
G	Integration test	1	F

- (i) Create a network diagram based on the task ID, duration and predecessors provided in Table 1. (8 marks)
- (ii) Based on the answer given in Question 1 c) (i), identify the critical path based on the task ID and specify the total duration needed to complete the project. (5 marks)

[Total: 25 marks]

### 1a) stakeholders

PS: A high-ranking manager who champions and supports a project  
(Larson, 2021)

## Project Stakeholder Management

### 1.4 Knowledge & Attributes of a Project Manager

#### 1. Identify Stakeholders

Identify the people, groups, or organizations that could impact or be impacted by a decision, activity, or outcome of the project; and analyze and document relevant information regarding their interests, involvement, interdependencies, influence, and potential impact on project success.

Output: Stakeholder register (e.g. 3)

Name	Position	Internal/External	Project Role	Contact Information
Stephen	VP of Operations	Internal	Project sponsor	stephen@globaloil.com
Betsy	CFO	Internal	Senior manager, approves funds	betsy@globaloil.com
Chien	CIO	Internal	Senior manager, PM's boss	chien@globaloil.com
Ryan	IT analyst	Internal	Team member	ryan@globaloil.com
Lori	Director, Accounting	Internal	Senior manager	lori@globaloil.com
Sanjay	Director, Refineries	Internal	Senior manager of largest refinery	sanjay@globaloil.com
Debra	Consultant	External	Project manager	debra@gmail.com
Suppliers	Suppliers	External	Supply software	suppliers@gmail.com

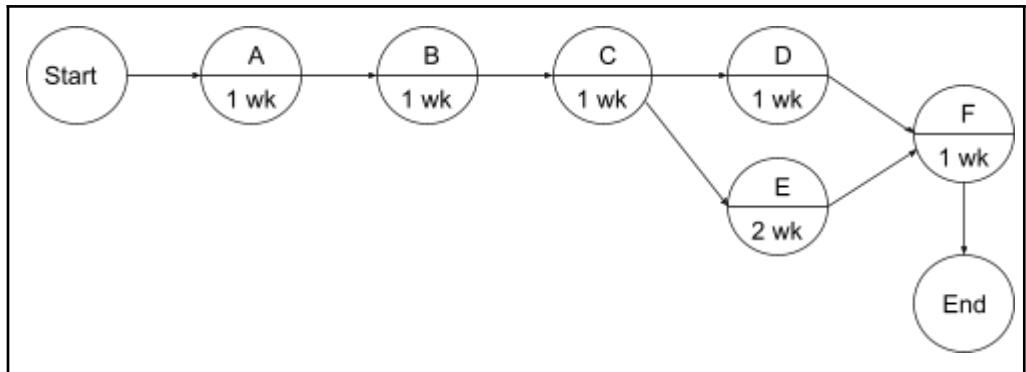
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1. Adam - his position is operation manager of Radex Company, which is the internal stakeholder that responsible to develop the CPS Project
2. Passengers - is customer(user) of Radex Company, which is external stakeholder of the CPS project

### 1b) types of prototyping process model

1. Incremental
2. Agile

1ci) Network diagram



1cii) Critical Path

Critical Path: A -> B -> C -> E -> F

Total Duration Needed:  $1 + 1 + 1 + 2 + 1 = 6$  weeks

**Question 2**

- a) Analyse **TWO (2)** product standards that should be enforced in CPS's project development.  
Explain your answer. (8 marks)

- b) Given the following information of project team A and B in Table 2.

Table 2: Size-oriented measurement of project team A and team B.

	Non-normalised		Normalised with KLOC	
	Team A	Team B	Team A	Team B
Programming language used	Java	Php	Java	Php
Total Lines of Code (LOC)	206,000	266,000		
Defects found	22	40		
Errors found	25	35		

Note: KLOC is thousand lines of code. Formula used: defects/KLOC and errors/KLOC.

- (i) Calculate the values in Table 2 under normalised with KLOC for both teams. Which project team produces higher quality of work? Explain your answer.

Show your workings in your calculation, round up to **five decimal points**. (9 marks)

- (ii) Evaluate **TWO (2)** drawbacks of size-oriented metric used in CPS's project development.  
Explain your answer. (8 marks)

[Total: 25 marks]

a) dd

b)

*Normalised with KLOC:*

*Team A*

$$\text{Total Lines of Code} = 206,000 \div 1000 = 206 \text{ KLOC}$$

$$\text{Defects Found per KLOC} = 22 \div 206 = 0.10680$$

$$\text{Errors Found per KLOC} = 25 \div 206 = 0.12136$$

*Team B*

$$\text{Total Lines of Code} = 266,000 \div 1000 = 266 \text{ KLOC}$$

$$\text{Defects Found per KLOC} = 40 \div 266 = 0.15038$$

$$\text{Errors Found per KLOC} = 35 \div 266 = 0.13158$$

The project team A produces a higher quality of work. This is because the defects found per KLOC of team A is lower and means that defects in team A are lesser than team B.

Besides, the errors found per KLOC of team A is also lower than team B and means that the errors in team A are lesser than team B

c)

### Question 3

- a) The risk projection shows the following information:

Adam has identified 50% of the existing software components can be reused and integrated into the current fares payment system. The remaining core modules have to be developed based on new requirements. The project team has to check the existing platform and operating system's version used to integrate with the new modules.

Risk identified is four junior developers have been assigned to develop the 35 new software components with duration of 4 weeks. The average software component is 120 Lines of Code (LOC) and the development cost for each LOC is RM12.00. Risk probability for the identified risk is 50%.

- (i) Calculate the following values using a Halstead's Risk Exposure (RE) metric:

- Cost to develop the 35 software components.
- Risk exposure.

Note: show the workings in your calculation. The RE formula is probability X cost.

(3 + 3 marks)

- (ii) Identify ONE (1) other potential risk that might occur in the CPS's project. You are required to include the following information:

- Specify the category that the risk belongs to.
- Propose a risk mitigation action for the identified risk. Explain your answer.

(7 marks)

- b) Adam has decided to use the Distributed Version Control (DVC) system for the CPS's project development. Describe TWO (2) benefits of DVC system to the project team's collaboration. Provide an explanation in your answers. (6 marks)

- c) Given below are two software quality attributes:

- Reliability
- Maintainability

In your opinion, which software quality attribute is most important to the CPS's project development? Justify your answer. (6 marks)

[Total: 25 marks]

#### Question 4

a) Adam has identified the project goal as *reduce time during system integration* to support the CPS's project process improvement.

Create a Goal Question Metric (GQM) proposal for the given goal and include the following information:

- Analyse **ONE (1)** question to assess the given goal.
- Propose **TWO (2)** relevant software metrics and explain how each of the software metrics can be applied to the suggested question. (9 marks)

b) Given below are two fault management approaches:

- Fault avoidance
- Fault detection

(i) Select a suitable fault management approach that can be applied in the CPS's project development. Explain each of the approaches mentioned above with an example. (9 marks)

(ii) *Any faults in the delivered software do not cause system errors.* Do you agree with this statement? Provide **TWO (2)** justifications in your answer. (7 marks)

[Total: 25 marks]

## Links

1. Tunku Abdul Rahman University of Management and Technology, Faculty of Computing and Information Technology (2025) [BAIT3153 Software Project Management \(Academic Year 2024/2025, May/June Examination\)](#). Past Year Question Paper (Unpublished)
2. Tunku Abdul Rahman University of Management and Technology, Faculty of Computing and Information Technology (2025) [BAIT3153 Software Project Management \(Academic Year 2024/2025, January Examination\)](#). Past Year Question Paper (Unpublished)
3. Tunku Abdul Rahman University of Management and Technology, Faculty of Computing and Information Technology (2024) [BAIT3153 Software Project Management \(Academic Year 2024/2025, October Examination\)](#). Past Year Question Paper (Unpublished)
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11. Tunku Abdul Rahman University College, Faculty of Computing and Information Technology (2021) [BAIT3153 Software Project Management \(Academic Year 2021/2022, December Examination\)](#). Past Year Question Paper (Unpublished)
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13. Tunku Abdul Rahman University College, Faculty of Computing and Information Technology (2021) [BAIT3153 Software Project Management \(Academic Year 2020/2021, April/May Examination\)](#). Past Year Question Paper (Unpublished)

14. Campbell University, North Carolina, U.S.A. (2020) [\*BAIT3153\(B\) Software Project Management \(Academic Year 2020/2021, December Examination\)\*](#). Past Year Question Paper (Unpublished)
15. Tunku Abdul Rahman University College, Faculty of Computing and Information Technology (2020) [\*BAIT3153 Software Project Management \(Academic Year 2020/2021, December E-Assessment\)\*](#). Past Year Question Paper (Unpublished)
16. Campbell University, North Carolina, U.S.A. (2020) [\*BAIT3153\(B\) Software Project Management \(Academic Year 2020/2021, September/October Examination\)\*](#). Past Year Question Paper (Unpublished)
17. Tunku Abdul Rahman University College, Faculty of Computing and Information Technology (2020) [\*BAIT3153 Software Project Management \(Academic Year 2020/2021, September/October Examination\)\*](#). Past Year Question Paper (Unpublished)
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