Section A — answer the question

1. a) JUSTIFY if these objectives are **SMART** or not, by referring to the various aspects of the SMART definition:

(5 marks)

i) The product should have an easy-to-use UI by the end of the year.

ii) This tax management software should include an embedded MKV video player by the end of November.

iii) This final year project should support hundreds of thousands of simultaneous players by the end of the year.

iv) The new website should load in less than 1 second for 90% of requests in a latest-generation Mac with Chrome, by the end of the month.

v) The game will include 10 levels.

b) PROVIDE THREE DIFFERENCES between the concepts of an **objective** and a **goal**, and PROVIDE EXAMPLES of each from your final year project.

(7 marks)

c) IDENTIFY TWO risks in your final year project. ANALYSE them, and PROPOSE a strategy to manage them. JUSTIFY your analysis and your choice of strategy.

(8 marks)

d) COMPARE **direct measurement** and **indirect measurement**. Suppose we define "defect density" as the number of defects divided by the size of the software. IDENTIFY if it would be a direct or indirect measurement, and EXPLAIN if it would be a valid measurement.

(6 marks)

e) STATE the types of **backlog** used in **Scrum**, and EXPLAIN when items are added or moved between them.

(4 marks)

END OF SECTION A

Section B — choose TWO of the THREE questions

2. a) A Canadian construction company would like to develop an employee portal with an HR focus to facilitate access to HR documents and increase engagement and satisfaction of the company's employees. A project manager has been appointed to manage this project. The HR portal is supported by a database which contains employee profiles (name, surname, age, position, skills, education, hire date, personal information, etc...).

When defining the **project plan**, in terms of **risk management**, the project manager identified two negative risks:

- R1: "The database used in the system cannot process as many transactions per second as expected"
- R2: "Key Staff are ill at critical times in the project"

i) IDENTIFY the **risk category**, justifying your answer. (4 marks)

ii) ESTIMATE the **severity** of the risk. (2 marks)

iii) PROPOSE a **mitigation strategy**, justifying your answer. (4 marks)

b) The details of all activities in a software project are listed below:

Activity	Depends on	Duration (weeks)
A		5
B	A	10
C		10
D	A, B	9
E	C, D	9
F	C	8
G	B, D	7
H	B, F	9
I	H	9

i) DRAW an **activity network** for this project AND use it to carry out a **critical path analysis** for this project. For EACH project activity, this analysis must identify:

- The **earliest** and **latest start**,
- the **earliest** and **latest finish**,
- the **float**.

(11 marks)

(continued...)

(Question 2 continued. . .)

ii) IDENTIFY the **critical path** and the **earliest finish time** for the project. (4 marks)

iii) EXPLAIN if it is possible for a project not to have a critical path, and if it is possible for a project to have more than one critical path. PROVIDE examples. (4 marks)

iv) DISCUSS how the information provided by the **critical path analysis** of a software project can be used by the project manager. (6 marks)

END OF QUESTION 2

3. a) DEFINE what is **estimation** in software project management and compare it against **measurement**.

(4 marks)

b) STATE the limitations of **measuring** and **estimating software size** in lines of code, and what are the alternatives.

(6 marks)

c) Consider the Likert scales commonly used in surveys, which can take values of -2 ("strongly disagree"), -1 ("disagree"), 0 ("neither agree nor disagree"), +1 ("agree"), and +2 ("strongly agree"). EXPLAIN which type of **scale** this would be, based on the **operations** that are admissible for it.

(4 marks)

d) A **cost estimate** is required for a new project Q, which involves the development of a client-server application. The size of Q has been estimated from its requirements as 100 ± 30 kSLOC (thousands of lines of code). Searching a database of previous similar projects, the following results were obtained:

- A project A_1 was found, with size recorded as 80 kSLOC, requiring 120 person-months (pms).
- A project A_2 was also found, with a size recorded as 50 kSLOC. It was carried out using a suite of tools later shown to INCREASE the effort needed on projects by 20%. A_2 required 80pm with those tools.

We know some things about Q:

- The cost-increasing tool from project A_2 will NOT be used.
- In Q, we will introduce a new certification process which is estimated to require an additional 10pm of effort.

i) Using **estimation by analogy**, DERIVE TWO separate **effort estimates** for project Q based on A_1 and A_2.

(9 marks)

ii) RESOLVE the differences between the two effort estimates. (3 marks)

iii) CONVERT to **financial cost**, assuming that the **unit effort rate** is $£3\,500/\text{pm}$.

(3 marks)

e) DESCRIBE THREE strategies for getting your final year project back on track, if you experienced delays due to unexpected events.

(6 marks)

END OF QUESTION 3

4. a) For your final year project, JUSTIFY if you would use **Scrum** or **Kanban**, and how you would adapt the methodology to the final year project.

(6 marks)

b) PROVIDE AN EXAMPLE of how the **Scrum backlogs** would look like in your final year project.

(4 marks)

c) COMPARE the concepts of **epic**, **user story**, and **task** in Scrum. PROVIDE AN EXAMPLE of each one of those in your final year project.

(6 marks)

d) DEFINE what **cost monitoring** is and EXPLAIN why project managers need to monitor the cost.

(3 marks)

e) The table below lists the activities required to develop a software module, with their dependencies and the optimistic, most likely, and pessimistic duration estimates (in days).

Activity	Depends on	Optimistic	Likely	Pessimistic
Specification	N/A	6	8	11
Design	Specification	5	9	12
Coding	Design	4	8	10
Testing	Coding	10	15	18

APPLY the **Program Evaluation and Review Technique (PERT)**, following these steps:

i) CALCULATE the **expected duration** and **standard deviation** for EACH activity in the previous table. SHOW your working clearly.

(8 marks)

ii) CALCULATE the **expected duration** and **standard deviation** for the entire set of activities.

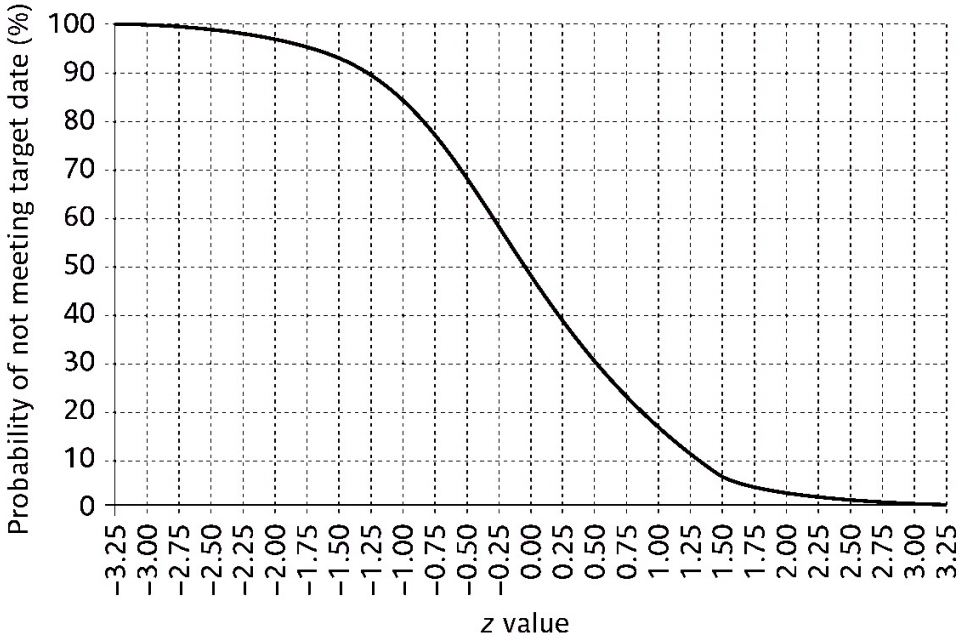
(4 marks)

iii) FIND an approximate value for the probability of not completing the development of the module in 38 days. You will need to use the information from the graph below.

(4 marks)

(continued...)

(Question 4 continued. . .)



END OF EXAMINATION PAPER