Questions 1 & 2 (both compulsory)

Question 1 *(Compulsory for 20 marks)*

(a)

Suppose that you need to demonstrate to your newly formed team of developers the fact that the use of standard modelling techniques as well as maintenance considerations are crucial aspects to always consider from the very start of any software development activity. How would you go about getting the message through - *specifically using David Parnas's 1987 landmark definition of Software Engineering*?

[10 marks (5/aspect)]

(b)

Consider a solution that allows customers to compose flower arrangements from individual flowers and fillers. Basically, users can select the type of flower arrangement (e.g. wreath, bouquet, single, stand, tabletop, etc.) and then proceed to indicate the type and number of flowers, attached note, delivery address, delivery date and any other comments. The solution will also allow the user to set a price tag before composing the arrangement and the solution will keep a running cost notification. What could serve as feedback and feedforward for such a system? Justify your answers.

[10 marks (4-identifying; 6-justification)]

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> *Enter answer text to question 1 (a) & (b) here. Indicate and separate your answer parts clearly.*

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Question 2 *(Compulsory for 20 marks)*

Your organisation plans to build and support software solutions that deal with the management of online assessments (similar to the WISEflow solution you are using at the moment). You are asked to provide a fully justified set of **FOUR** software solution quality attributes that would need to be considered according to the context in which such a solution will be used as well as the functionality required by such a solution. Management appreciates the risks involved in such a step and therefore insists that all recommendations and proposals are soundly grounded in fact and that all reasoning be fully justified - in your case, using concepts, reasoning and principles discussed in class.

(Hint: You need to consider this scenario in the light of software quality explanations and discussions during classes. You may wish to refer to the slide with the various quality attributes as a starting point)

[20 marks (4-solution context & function; 8-quality analysis of solution; 8-reasoning & justification)]

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> *Enter answer text to question 2 here.*

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Questions 3, 4 & 5 (to choose any two)

Question 3 *(Selectable for 30 marks)*

(a)

Consider a software solution for online payments by purchasers to various merchants. List and describe the various quality attributes that would apply to such a solution from the point of view of 1) the users (i.e. the entities who will be actually using the solution for their routine work; 2) the clients (i.e. the entities that will be commissioning and financing the solution); 3) the system administrator(s) (i.e. the entities that will be supporting and configuring the solution). Justify your quality listings.

[15 marks (5/view)]

(b)

Over the span of the construction of several largely similar projects, your development team has had a very positive experience with the adoption of reuse practices in their development process. The team is now tasked with a project that involves a degree of innovation and novelty and differs considerably from previous projects. The plan is to rely on reuse as per previous projects. What are your views on this? Explain and justify your views.

[5 marks]

(c)

Suppose that an electronic solution controlling the operations of a car is composed of 1) the software solution itself; 2) the inbuilt firmware of the specific vehicle (i.e. the specific vehicle hardware-dependent code); 3) the sensors and actuators (i.e. the physical sensing and electromechanical devices). Taking reliability to be measured as a value in the range 0 to 1, and assuming that the reliability of the various elements in the solution is 0.899 for (1); 0.966 for (2), and 0.989 for (3), what would the overall reliability for the solution be? What would you suggest be done should the overall reliability of the solution need to be increased? Justify your answer on the basis of this scenario. If one wanted to make the overall solution more robust, what would you propose? Again, justify your answer on the basis of this scenario.

[10 marks (2-reliability value; 4-increase reliability & justify; 4-introduce robustness & justify)]

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Enter answer text for question 3 (a), (b) & (c) here.

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Question 4 *(Selectable for 30 marks)*

(a)

The Agile Philosophy is governed by nine principles. Which **THREE** of these nine principles secure the following benefits - Quality, Commitment and Ownership? Explain and justify each choice.

[9 marks (3/benefit)]

(b)

The Agile philosophy is based on the 80/20 pareto principle. In your own words explain the difference between the Traditional (i.e. non-Agile) approach and the Agile approach. In your answer, please explain what you understand by the paradigm shift required to secure an agile mindset.

[12 marks (4-difference; 8-explanation)]

(c)

What do you understand by the term "Project Shaping", and what is the process that an Agile team must follow to ensure that the project is well and properly "shaped"?

[9 marks (4-understanding; 5-explanation)]

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Enter answer text to question 4 (a), (b) & (c) here.

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Question 5 *(Selectable for 30 marks)*

Consider a software solution that manages print requests (jobs) to a printer through a printing queue. Say, **you need to formally prove the following TWO (2) cases** for this software solution for which you are responsible. Use formal algebraic specification equivalence descriptions to achieve this.

> CASE 1: Placing a print job on an empty printing queue and removing a print job from that queue will result in an empty printing queue;

> CASE 2: Placing **TWO** print jobs on the printing queue and then counting the print jobs on the queue will yield a value of "*2*".

[30 marks (6-signatures; 14-axioms; 10-proofs)]

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Enter answer text for question 5 here.

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