COMP4130

SOFTWARE QUALITY AND PROCESS MANAGEMENT

Final Examination – June 2009

Instructions:

- **Exam reading time: 15 minutes**
- **Exam duration: three (3) hours**
- **The exam is worth 50% of the final grade and contains a total of 100 marks.**
- **The exam is in two (2) sections and comprises questions on both Software Quality and Software Process Management.**
- **Answer the one (1) question from Section A on Software Quality in Script Book A.**
- **Answer the five (5) questions from Section B on Software Process Management in Script Book B.**
- **Clearly identify each answer by writing the corresponding Part and Question Number on the top of each page that you use to write the answer.**
- **There are no permitted materials for this exam.**
- **Turn in the question sheet with your script books at the end of the exam.**

SECTION A: CHOOSE ONE QUESTION FROM THIS SECTION OF THE EXAM AND WRITE YOUR ANSWERS IN SCRIPT BOOK A

Question A-1: Provide answers to all parts of one of the following three options (a) or (b) or (c) (20 marks)

Option (a): Imagine that you are leading an Verification &Validation (or Testing) team that must provide a Master Test Plan (or Software Verification and Validation Plan) to be used to evaluate appropriate development artefacts for a software system project that is to deliver a product that is not critical to human lives/injury if operational errors occur. Also imagine that the software requirements specification is almost complete (at least from the analysts' perspective).

i. Assuming that the Master Test Plan will contain a Table of Contents, what is that Table of Contents likely to list? Provide support for your answer. **(3 marks)**

ii. Is the current stage of development the best time for producing a Master test Plan? Justify your answer. **(3 marks)**

iii. From the Table of Contents you produced in (i) above, what topics are going to receive the major focus? Explain and/or justify your answer. **(5 marks)**

iv. Assuming that the software project follows through with the Master test Plan, what level of cost savings would you expect, and what activities are likely to produce the highest proportion of that cost saving? Provide support for your estimate. **(5 marks)**

v. Discuss the advantages/disadvantages of leaving the production of a Master Test Plan until the code is (say) 85% complete. **(4 marks)**

OR

Option (b): In regard to TESTS respond to the following:

i. Describe the typical approach to testing including the types of inputs and outputs that are necessary to run tests and to identify problems. **(4 marks)**

ii. What is the purpose of each of the following: (1) Unit; (2) Integration; and (3) Acceptance testing? **(4 marks)**

iii. Describe (with drawings if necessary) the difference between "bottom up" and "top down" integration testing. **(4 marks)**

iv. Describe what would be typically contained in an acceptance test. **(4 marks)**

v. Describe the role of testing in regard to "change control". **(4 marks)**

OR

Option (c): In regard to CAUSAL Factors:

It has been known for many years, by Dr Barry Boehm and others, that "development team related factors" have the most influence on the success of a project. In his Cost Construction Model (CoCoMo), Boehm refers to seven (7) items under the heading of "development team related factors", the first 6 (in order of influence) being:

1. Analyst Capability (ACAP)
2. Programmer Capability (PCAP)
3. Personnel Continuity (PCON)

4. Application Experience (AEXP)

5. Language and Tool Experience (LTEX)

6. Platform Experience (PEXP)

i. Discuss why you think these factors are important, and why you think they have the order of influence indicated. Relate your answer to software lifecycle activities including those to do with quality. Where possible provide examples to support your views. **(10 marks)**

ii. CoCoMo II (the latest version of the CoCoMo) includes a TEAM COHESION factor which actually has a range of influence that is significantly greater than any of the six (6) factors listed above. Discuss why you think this might be so. Where possible provide examples or justification for your answer. **(10 marks)**

SECTION B: WRITE YOUR ANSWERS FOR ALL FIVE (5) QUESTIONS FROM THIS SECTION OF THE EXAM IN SCRIPT BOOK B

Question B-1: PSM Information Needs and Analysis Activities (15 marks)

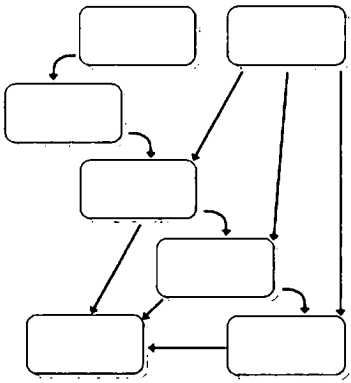
Part 1: What is the definition of an information need in PSM? **(4 marks)**

Part 2: Why does PSM require the identification of information needs? In your response identify how information needs affect and influence the rest of the measurement activities. **(5 marks)**

Part 3: Describe the different types of analysis activities that are conducted under PSM. In your response include the reasons for conducting the different types of analyses and when in the project lifecycle they are typically conducted. **(6 marks)**

Question B-2: PSM Analysis Model (25 marks)

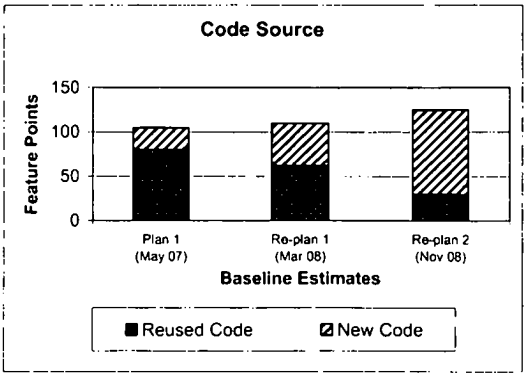
Part 1: Insert the PSM Information Categories into their correct location within the PSM Analysis Model. **(5 marks)**

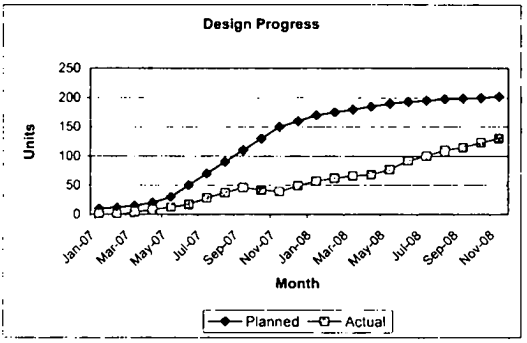


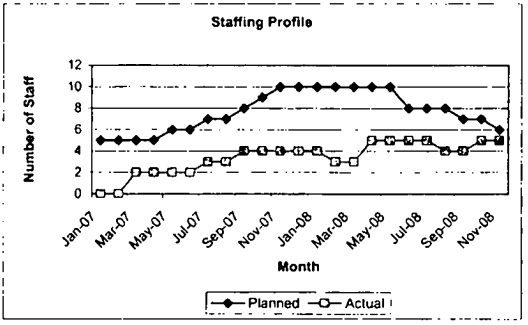
Part 2: Using the PSM Analysis Model, explain the concepts of 'leading' and lagging' information providing examples of how the information categories affect each other. **(5 marks)**

Part 3: Analyse the following indicators and provide a brief summary of the status of the project. Using the PSM Analysis Model, identify the underlying issues that are contributing to the schedule delays being experienced by the project. **(15 marks)**

Question B-2: PSM Analysis Model (25 marks)







Question B-3: CMMI® Structure (10 marks)

Part 1: List the capability levels of the Continuous Representation of the CMMI®. **(1 marks)**

Part 2: List the maturity levels of the Staged Representation of the CMMI®. **(1 marks)**

Part 3: How are capability and maturity levels related? **(2 marks)**

Part 4: Complete the following statements: **(2 marks)**

(a) _____ are required components of the CMMI®;

(b) _____ are expected components of the CMMI®; and

(c) _____ are informative components of the CMMI®.

Part 5: How are practices and goals related in the CMMI®? **(2 marks)**

Part 6: Describe the two types of practices and goals contained within each process area of the CMMI®. In your answer describe how the practices and goals lead to the institutionalisation of a process area. **(2 marks)**

Question B-4: CMMI® Content (10 marks)

Part 1: In the CMMI®, what does the phrase 'establish and maintain' mean? What is the significance of the phrase to process institutionalisation? **(5 marks)**

Part 2: Describe the difference(s) between the following two Specific Practices from the Requirements Development Process Area: **(5 marks)**

SP 3.3 Analyse requirements to ensure that they are necessary and sufficient.

SP 3.4 Analyse requirements to balance stakeholder needs and constraints.

Question B-5: SCAMPI[SM] A and CMMI® Content (20 marks)

Evaluate the evidence under the following SCAMPI[SM] Class A appraisal scenario to characterise Specific Practice 1.1 in the Risk Management (RSKM) process area. Use the SCAMPI[SM] Class A practice characterisation scale provided in Table 1 (located on page 8). The relevant extract from the CMMI® (Specific Practice 1.1 and its corresponding informative material) is provided in Table 2 (located on pages 9 to 10).

You are required to identify the corresponding strength(s) or weakness(es) associated with the characterisation you have assigned to Specific Practice 1.1. You are also required to list the objective evidence you have used to come to your conclusions. Structure your response following the format shown in Table 3 (located on page 10).

The project being appraised provided the following evidence:

In an interview session, the project manager (who has been on the project for almost three years) stated that she referred to a checklist to help her identify the risks for the project. She stated that the checklist groups typical project risks against cost, schedule, technical and quality categories.

In a separate interview session, the engineering manager (who has been on the project for over 18 months) stated that he knew of a checklist being previously established but was not aware when it was last used on the project to assist with risk identification. He adds that he has never used such a checklists but rather relies on the 'Risk Types' pull-down menu in the project's risk log when categorising risks at the monthly risk workshops.

An evaluation of the project's risk management plan showed that reference was made to a risk identification checklist as Annex B to the plan. When you get to Annex B however, you find it is blank and has a statement on the top of the page making reference to an Excel file called AnnB_risk_checklist_Oct04.xls. Your appraisal team requests an electronic copy of the Excel file to be provided. When it is eventually provided by the project your examination of the file shows a listing of typical project risks under cost and schedule categories. No evidence could be found of other categories.

During a tool demonstration session, you find that the 'Risk Types' pull-down menu in the project's risk log (an Access database) contains options for categorising risks as either 'Cost', 'Schedule', 'Technical', 'Quality' or 'Other'.

Your evaluations of the risk management plan, risk checklist and project risk log do not identify evidence of risk sources being defined.

Table 1: SCAMPI[SM] A Practice Characterisation Scale	
Practice Characterisation	**Objective Evidence Criteria**
FULLY IMPLEMENTED (FI)	• One or more direct artifacts are present and judged to be adequate; • At least one indirect artifact and/or affirmation exists to confirm the implementation; and • No weaknesses are noted.
LARGELY IMPLEMENTED (LI)	• One or more direct artifacts are present and judged to be adequate; • At least one indirect artifact and/or affirmation exists to confirm the implementation; and • One or more weaknesses are noted.
PARTIALLY IMPLEMENTED (PI)	• Direct artifacts are absent or judged to be inadequate; • One or more indirect artifacts or affirmations suggest that some aspects of the practices are implemented; and • One or more weaknesses are noted; OR • One or more direct artifacts are present and judged to be adequate; • No other evidence (indirect artifacts or affirmation) support the practice implementation; and • One or more weaknesses are noted.
NOT IMPLEMENTED (NI)	• Direct artifacts are absent or judged to be inadequate; • No other evidence (indirect artifacts or affirmation) support the practice implementation; and • One or more weaknesses are noted.
NOT YET (NY)	• The project or support group has not yet reached the stage in the lifecycle to have implemented the practice.

Table 2: Extract from the CMMI®

SP 1.1 Determine Risk Source and Categories

Determine risk sources and categories.

Identification of risk sources provides a basis for systematically examining changing situations over time to uncover circumstances that impact the ability of the project to meet its objectives. Risk sources are both internal and external to the project. As the project progresses, additional sources of risk may be identified. Establishing categories for risks provides a mechanism for collecting and organising risks as well as ensuring appropriate scrutiny and management attention for those risks that can have more serious consequences on meeting project objectives.

Typical Work Products

1. Risk source lists (external and internal)
2. Risk categories list

Subpractices

1. Determine risk sources.

   Risk sources are the fundamental drivers that cause risks within a project or organisation. There are many sources of risks, both internal and external, to a project. Risk sources identify common areas where risks may originate. Typical internal and external risks sources include the following:

   - Uncertain requirements
   - Unprecedented efforts – estimates unavailable
   - Infeasible design
   - Unavailable technology
   - Unrealistic schedule estimates or allocation
   - Inadequate staffing and skills
   - Cost or funding issues
   - Uncertain or inadequate subcontractor capability
   - Uncertain or inadequate vendor capability
   - Inadequate communication with actual or potential customers or with their representatives
   - Disruptions to continuity of operations

   Many of these sources of risk are often accepted without adequate planning. Early identification of both internal and external sources of risk can lead to early identification of risks. Risk mitigation plans can then be implemented early in the project to preclude occurrence of the risks or reduce the consequences of their occurrence.

2. Determine risk categories.

   Risk categories reflect the "bins" for collecting and organising risks. A reason for identifying risk categories is to help in the future consolidation of the activities in the

Table 2: Extract from the CMMI®
risk mitigation plans. The following factors may be considered when determining risk categories: • The phases of the project's lifecycle model (e.g., requirements, design, manufacturing, test and evaluation, delivery, and disposal) • The types of processes used • The types of products used • Program management risks (e.g., contract risks, budget/cost risks, schedule risks, resources risks, performance risks, and supportability risks) A risk taxonomy can be used to provide a framework for determining risk sources and categories.

Table 3: Format for Response to Question 3			
Practice	**Characterisation** **(FI, LI, PI, NI or NY)**	**Strength(s) / Weakness(es)**	**Objective Evidence** • **Direct Artefact,** • **Indirect Artefact,** • **Affirmation**
RSKM SP1.1	**(10 marks)**	**(5 marks)**	**(5 marks)**

End of COMP4130 exam