UNIVERSITY OF MAURITIUS

FACULTY OF ENGINEERING

SECOND SEMESTER EXAMINATIONS

MAY 2015

PROGRAMME	BSc (Hons) Computer Science		
MODULE NAME	Software Engineering – Special Paper		
DATE	Friday 22 May 2015	MODULE CODE	CSE2142(3)
TIME	13:30 – 15:30 Hrs	DURATION	2 hours
NO. OF QUESTIONS SET	4	NO. OF QUESTIONS TO BE ATTEMPTED	4

INSTRUCTIONS TO CANDIDATES

Answer any 4 questions.

All questions carry equal marks.

Answer any 4 questions.

All questions carry equal marks.

Question 1

You have been awarded the contract to design a computer system for a new park that is going to host one of the most dangerous animal on earth. The initial statement of requirements is given below.

The computer system shall monitor the movements of all animals in the park, as well as the movements of the game warden in order to be able to prevent attacks.

Each animal will be fitted with a small radio transmitter, which will emit a signal at frequent intervals. The signals will be picked up by three receivers, which will relay to the central computer the direction from which each signal from each animal was received. The central computer shall analyze these signals in order to calculate the position of each animal. The position of the animals shall be computed within 0.1 seconds.

The pens enclosing each species will be surrounded by electric fences to prevent them from straying into one another's areas, or onto the road used by the tourist. The computer system shall detect any damage to any of these fences and raise an alarm when necessary. An alarm must be raised if any animal strays out of its enclosure.

The interface of the system shall be menu based so that it will be easy to use by the staff in the control center. It shall automatically "bleep" the veterinary, if any animal is injured. The system shall be ready for the planned opening of the park next July, and shall not cost more than Rs 5 million.

(a)   Write down three functional and three non-functional requirements, quoted from the text above.   **[6 marks]**

(b)   Requirements should state what a system should do, without stating how it should do it. Why is this distinction useful?   **[2 marks]**

(c)   Which system structural model would you recommend for this design architecture. Give reasons for your choice.   **[4 marks]**

(d)   Briefly explain the requirement elicitation and analysis phase and outline two reasons why it is a difficult process.   **[2 + 2 marks]**

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(Question 1 continued)

(e)   Rewrite the following (vague) requirements so that they may be objectively validated.

- The system should have a good response time.
- The system should be highly portable.
- The system must be reliable.
- The system must be operated with minimum training.

[4 marks]

(f)   There are several life cycle models to represent software development. One of them is the spiral model. With the help of a diagram briefly describe the spiral development life-cycle model.

[5 marks]

Question 2

(a)   (i)   Software maintenance activities can be classified as corrective (fixing errors), adaptive (responding to change) and perfective (improving the original software). Why is this distinction useful?

[3 marks]

(ii)   With the help of a diagram, briefly describe the maintenance process activities.

[5 marks]

(b)   (i)   What type of errors are discovered during black-box testing?

[3 marks]

(ii)   Using an example, explain the equivalence partitioning technique.

[3 marks]

(c)   Using the code snippet in Figure 1, answer the following questions.

(i)   What is a flow graph?   **[2 marks]**
(ii)   Draw a flow graph to represent the flow of control.   **[6 marks]**
(iii)   Calculate the cyclomatic complexity.   **[1 mark]**
(iv)   Identify the different independent paths.   **[2 marks]**

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(Question 2 continued)

```
int y=1;

int x=10;

while (x>=0) {

y=y*x;

if (y >0){

      y=y+2;

      x=x-1;

        }

else

      y=0;

}// end while

cout<<x;
cout<<y;
```

Figure 1

Question 3

(a)   (i)   Briefly describe the different types of plan; in addition to software project plan that a software project manager have to draw up.

[4 marks]

(ii)   Briefly explain why the process of project planning is iterative and why a plan must be continually reviewed during a software project.

[3 marks]

(b)   Use the task durations and dependencies for a software project shown in Table1 to do the following:

(i)   Illustrate the dependencies between the different tasks with an activity network diagram.   **[7 marks]**

(ii)   Explain what is the critical path. Highlight the critical path in (b)(i) above.   **[2 marks]**
(continued next page)

(Question 3 continued)

Task	Duration	Dependencies
T1	30	-
T2	14	T3,T6
T3	16	T4
T4	14	-
T5	10	T2,T7
T6	20	T4
T7	17	T1,T3
T8	30	T4
T9	10	T2,T8
T10	56	-

Table 1

(c)   (i)   Briefly explain the different stages of the SEI capability maturity model.

[5 marks]

     (ii)   What is the difference between process metrics and project metrics? Give an example for each type of metrics.

[4 marks]

Question 4

(a)   (i)   What is Function point analysis and give two advantages of using it to estimate size of a software.

[3 marks]

     (ii)   Describe the class of software estimation techniques known as

- Expert judgement.
- Estimation by analogy.
- Pricing to win.

[3 marks]

     (iii)   Using the COCOMO method: if the number of delivered source code instructions is 125,000 and the value of the constraints a, b and c & d in the Basic COCOMO model are 3.0, 1.12, 2.5 and 0.35 respectively, what is the total effort in person months and the total development time?

[3 marks]

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(Question 4 continued)

(b)   (i)   With the help of a diagram, describe risk management.

[4 marks]

       (ii)   Consider the software project risks shown below. For each risk identify a possible risk category. Briefly describe possible risk management strategy for each risk.

- Changes to requirements, which require major design rework, are proposed.
- Software components which should be reused contain defects which limit their functionality
- Time required to develop the software is underestimated

[6 marks]

(c)   (i)   Briefly explain **cohesion**. Identify which type of cohesion the following module exhibits. A module that does the following

- Print next line
- Reverse string of characters in second argument
- Add 7 to 5th argument
- Convert 4th argument to float

[3 marks]

       (ii)   Briefly explain **coupling**. Identify which type of coupling the following module exhibits. A Process control module that maintains current data about state of operation, it gets data from multiple sources. Supplies data to multiple sinks.

[3 marks]

END OF QUESTION PAPER

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