Allah Kary jo edit kry wo paper me fail ho jaye (Ameen)

National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Software Engineering**	**Course Code:**	**CS303**

	Program:	**BS (CS)**	**Semester:**	**Fall 2016**
	Duration:	**150 Minutes (2.5 Hours)**	**Total Marks:**	**60**
	Paper Date:	**16-Dec-16**	**Weight**	**40%**
	Section:	**ALL**	**Page(s):**	**6**
	Exam:	**Final**		

Instruction/Notes:

1. A double-sided, hand-written, A4-size help sheet is allowed.
2. Focus on your own question paper. Don't look here and there.
3. Attempt all questions on the question paper. Neither use nor submit any extra sheet.

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Question 1 (Max. Marks = 15)

Fill in the blanks with appropriate words or phrases.

a. Umbrella activities are independent of any one framework activity and occur throughout the process.
b. The incremental model combines elements of the waterfall model applied in an iterative fashion.
c. Unlike other process models that end when software is delivered, the spiral model can be adapted to apply throughout the life of the computer software.
d. The RAD model is a “high-speed” adaptation of the waterfall model, in which rapid development is achieved by using a component-based construction approach
e. The W^5HH principle provides a series of questions that lead to a definition of key project characteristics and the resultant project plan.
f. A jelled team is a group of people so strongly knit that the whole is greater than the sum of the parts.
g. During requirements negotiation, all “win-lose” situations ultimately become “lose-lose” situations.
h. Requirements management is a set of activities that help the project team identify, control, and track requirements and changes to requirements at any time as the project proceeds.
i. Abstraction and refinement are complementary concepts.
j. Good programming practices are programming-language independent.
k. A testing strategy provides a road map that describes the steps to be conducted as part of testing, when these steps are planned and then undertaken, and how much effort, time, and resources will be required.
l. Unit testing focuses on the internal processing logic and data structures within the boundaries of an individual component.
m. Bottom-up integration eliminates the need for complex stubs.
n. Regression testing is the re-execution of some subset of tests that have already been conducted to ensure that changes have not propagated unintended side effects.
o. Beginning with a symptomatic indication of a problem, the debugging activity must track down the cause of an error.

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Question 2 (Max. Marks = 15 = 5 + 10)

a. **Tick** the correct option.

1) Which of the following is **not** a characteristic of software?
   a. Software does not wear out
   b. Software is flexible
   c. Software is not manufactured
   d. Software is always correct

2) All of the following process models are iterative:

   a. classic life cycle, incremental model, prototyping.
   b. waterfall model, prototyping, spiral model.
   c. incremental model, prototyping, spiral model.
   d. waterfall model, incremental model, prototyping.

3) Which of the following elements of the analysis model depict the dynamic behavior of software?
   a. Scenario-based elements.
   b. Flow-oriented elements.
   c. Class-based elements.
   d. Behavioral elements.

4) Project stakeholders include
   a. end-users
   b. developers
   c. customers
   d. All of the above

5) Software design
   a. is a sequential process.
   b. is the first software engineering action within the modeling activity.
   c. is the place where quality is fostered in software engineering.
   d. is part of the problem-space.

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b. For each of the statements given in the table below, underline either True or False.

S#	Statement	True/False
1	Legacy software is characterized by longevity and business criticality.	True False
2	The end-result of requirements elaboration is a design model that defines the informational, functional, and behavioral domain of the problem.	True False
3	Java is a second generation programming language.	True False
4	In order to help maintenance programmers, variable names should be inconsistent and meaningful.	True False
5	Blank lines and indentation are useful in improving code readability.	True False
6	Effective software project management focuses on the four P's: people, prototypes, process, and project.	True False
7	According to Constantine's closed (organizational) paradigm, teams are structured along a traditional hierarchy of authority.	True False
8	Agile teams are small in size, comprise highly motivated individuals, and have autonomy to plan and make technical decisions.	True False
9	The first software project management activity is preparation of a project plan.	True False
10	If the project as a whole is to be completed on schedule, half of the tasks lying on the critical path must be completed on schedule.	True False

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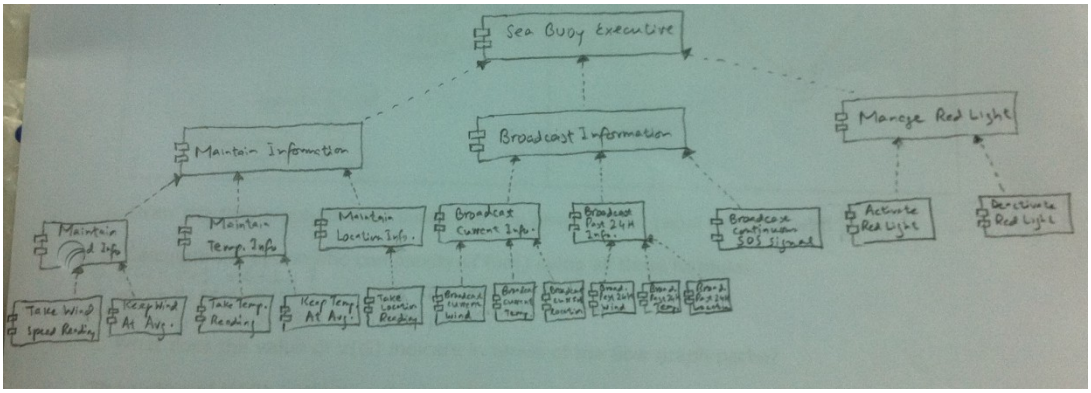
Question 3 (Max. Marks = 10 = 8 + 2)

There exists a collection of free-floating buoys that provide navigation and weather data to air and ship traffic at sea. The buoys collect air and water temperature, wind speed, and location data through a variety of sensors. Each buoy may have a different number of wind and temperature sensors and may be modified to support other types of sensors in the future. Each buoy is also equipped with a radio transmitter (to broadcast weather and location information as well as an SOS message) and a radio receiver (to receive requests from passing vessels). Some buoys are equipped with a red light which may be activated by a passing vessel during sea-search operations. If a sailor is able to reach the buoy, he or she may flip a switch on the side of the buoy to initiate an SOS broadcast. Software for each buoy must:

- Maintain current wind, temperature, and location information; wind speed readings are taken every 30 seconds, temperature readings every 10 seconds and location every 10 seconds; wind and temperature values are kept as a running average.
- Broadcast current wind, temperature, and location information every 60 seconds.
- Broadcast wind, temperature, and location information from the past 24 hours in response to requests from passing vessels; this takes priority over the periodic broadcast.
- Activate or deactivate the red light based upon a request from a passing vessel.
- Continuously broadcast an SOS signal after a sailor engages the emergency switch; this signal takes priority over all other broadcasts and continues until reset by a passing vessel.

Without making any assumptions, use the information provided above to answer the following questions.

a. Draw the (UML 1) component diagram for the sea buoy software.



b. If you were to choose an architectural style for the sea buoy software which architectural style would you select? Justify your answer.

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Question 4 (Max. Marks = 10 = 5 + 2 + 1 + 2)

```
int foo (int x, int y)
{
        int result = 0;
        if (x != y && y < 10)
        {
                while (x != y)
                {
                        if (x < y)
                        {
                                x++;
                                        }
                                        else
                                        {


                x--;
                                        }
                                        result+
                +;
                        }
                        result  += ( x + y);
        }
        else
        {
                int z = 0;
                for (int i = 0; i < 5; i++)
                {
                        for (int j = 0; j < 5; j+
+)
                        {
                                z += (i * j);
                                        }
                        }
                        result = z;
        }
```

a. Draw the flow graph of foo() inside the box given above. Label the code with nodes.

b. Calculate the cyclomatic complexity of foo() using all three formulas.

c. What does the value of V(G) indicate in terms of the flow graph paths?

The value of V(G) indicates the maximum number of linearly independent paths in the flow graph.

d. Suppose an application has only three functions - f1, f2, f3 - with V(G) values 10, 8, 11 respectively. Which function should be given the highest priority for testing? Justify your answer.

Function f3 should be given the highest priority since it has the highest value of V(G). Chances of error are more in this function as compared to the other functions.

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Question 5 (Max. Marks = 10 = 5 + 5)

A weather forecast application predicts the chances of rainfall by looking at the temperature (T) in degree Celsius (0.0 – 15.0, 15.1 – 25.0, 25.1 – 50.0), the atmospheric pressure (P) in Hectopascal (0.0 – 500.0, 500.1 – 1500.0), and the wind speed (S) in kilometers per hour (0.0 – 10.0, 10.1 – 50.0, 50.1 – 100.0). The rainfall prediction module of this application uses the rainfall probabilities shown in the table below.

T		0.0 – 15.0		15.1 – 25.0		25.1 – 50.0	
P		0.0 – 500.0	500.1 – 1500.0	0.0 – 500.0	500.1 – 1500.0	0.0 – 500.0	500.1 – 1500.0
S	*0.0 – 10.0*	0.1	0.0	0.4	0.3	0.7	0.6
	10.1 – 50.0	0.2	0.1	0.5	0.4	0.8	0.7
	50.1 – 100.0	0.3	0.2	0.6	0.5	0.9	0.8

Use Equivalence Class Partitioning and Boundary Value Analysis to fill out the following two tables for black-box testing of the rainfall prediction module. Use **minimum** test cases in the last table.

Variable	**Valid ECs**	**Representing values**		**Invalid ECs**	**Representing values for invalid ECs**
		For valid ECs	**Boundary values**		
T	(1) 0.0 – 15.0 (2) 15.1 – 25.0 (3) 25.1 – 50.0	5. 20.0 35.0	0.0, 15.0 15.1, 25.0 25.1, 50.0	(1) Values > 50.0 (2) Any alpha-numeric values (not Temperature)	60.0 ABC
P	(1) 0.0 – 500.0 (2) 500.1 – 1500.0	250.0 750.0	0.0, 500.0 500.1, 1500.0	(1) Values > 1500.0 (2) Any alpha-numeric values (not Pressure)	1600.0 EFG
S	(1) 0.0 – 10.0 (2) 10.1 – 50.0 (3) 50.1 – 100.0	5.0 30.0 80.0	0.0, 10.0 10.1, 50.0 50.1, 100.0	(1) Values > 100.0 (2) Any alpha-numeric values (not Speed)	200.0 XYZ

Test case type	**Test case no.**	**T**	**P**	**S**	**Test case results**
For valid ECs	1	5.0	250.0	5.0	0.1
	2	20.0	750.0	30.0	0.4
	3	35.0	250.0	80.0	0.9
	4	0.0	0.0	0.0	0.1
	5	15.0	500.0	10.0	0.1

	6	15.1	500.1	10.1	0.4
	7	25.0	1500.0	50.0	0.4
	8	25.1	0.0	50.1	0.9
	9	50.0	0.0	100.0	0.9
For invalid ECs	10	60.0	250.0	5.0	Invalid temperature
	11	ABC	250.0	5.0	Invalid temperature
	12	20.0	1600.0	5.0	Invalid pressure
	13	20.0	EFG	5.0	Invalid pressure
	14	20.0	250.0	200.0	Invalid wind speed
	15	20.0	250.0	XYZ	Invalid wind speed