

ME Software Engg 1<sup>st</sup> Semester Examination, 2011

Principles of Software Engineering

TIME: 3 Hours

FULL MARKS: 100

Answer Any FIVE Questions

**Guidelines for the Examinee:-**

1. Always start a new question in a fresh page.
2. While answering a question, please write the complete question number like, 1a, 2c, 4d etc.
3. Precise and to-the-point answer will be rewarded.
4. Legible handwriting and clean drawing will be rewarded.
5. Answering more than 5 questions will be penalized.

1. a) Describe how Software Engineering stands apart from System Engineering and Computer Science?

b) Considering the fact that there are quite a few Software Process Models, one has to apply certain logistics regarding choosing a particular process model over the others for different kind of customer/vendor situations. The following table tries to capture these scenarios. In this table, the 2<sup>nd</sup> column from the left describes different types of customer/vendor situations. There are altogether 15 such situations. Please go through all these situations and apply your own logistics regarding choosing a particular process model which will be appropriate to develop the software product taking care of that particular situations. Please mark the corresponding entry under the correct process model column.

Situation No	Different Customer/Vendor Situation	Waterfall	Evolutionary	Incremental	Reuse Oriented	RAD	Evolutionary Proto	Throwaway Proto	Boehm's Spiral
1.	The customer is not in a hurry. They are very much well aware about their requirement. They don't mind taking a conservative approach towards developing the product.	✓							



2	The Software needs to be deployed as soon as possible.								
3	The Customer is very cautious about taking wrong steps. They need to assess risks after every cycle.								
4	The Customer wants to get a look and feel about the product which they will get at the end of the road. They don't mind spending some little money now, so that they can get some idea about the product upfront.								
5	The situation here also is the same as above, but customer feels that their initial little investment should be protected as much as possible.								
6	The customer has enough money and time. The vendor also has enough man power. Both the parties are well aware of the requirements.								
7	The Vendor does not have sufficient manpower. And the customer does not have any kind of strict time frame regarding receiving the final product.								
8	The time is of great importance for the customer. The customer does not mind if the vendor uses off-the-shelf components for developing the product. The customer is also ready to tweak the requirements for this purpose if necessary.								
9	Getting the product idea upfront is a priority for the customer. They (customer) don't mind spending some extra money at the beginning, so that they are not in the dark about the look and feel of the final product.								
10	The customer does not have much idea regarding the behavior of the end product, and so as the vendor. So customer is ready to take it as it goes on and the product gets developed bit by bit.								
11	The customer does not want to wait till to the end to receive the final product; rather they want intermediate version of the product which they will use to train their internal staff.								



12.	The customer does not mind using the modules and components from the older version of the product								
13.	As far as customer is concerned, assessing risk at every phase of the software development life cycle is a priority.								
14.	The customer is very much comfortable towards the incremental development approach when it comes about developing the product.								
15.	The customer wants to have the product within next 75 days. They don't mind if parallel teams work to develop the product								

(5 + 15)

2. Draw the ERD and DFD (level 0 and level 1 only) for the following problem. Also, prepare the Data Dictionary for the same problem. (7+8+5)

The department of public works for a large city has decided to develop a Web-based Pothole Tracking and Repair System (PTRS). Citizens can log onto a Website and report the location (street name, number and on which portion of the street the pothole lies, e.g., middle curbs etc.) and severity (in a scale of 1 to 10, depending upon the size of the pothole). Citizens also log their name, address and phone numbers. Every such report is stored with a Pothole Identifying Number (PIN). This list is consulted around end of the week by the Higher Administrative Authority (HAA) and assigned a repair priority number (depending upon severity and street address) for every PIN. This list can be called Pothole Occurrence List (POL).

During the beginning of every week the repair department consults the POL and prepares PTL (Pothole Tracking List). In PTL, there will be Pothole Status Information (the values of status are 'work in progress', '% of completion', 'repaired', 'not repaired' and 'temporary repair') and repair team number against every PIN.

At the end of the repair, the repair department also prepares Pothole Expense List (PEL), where all the expenses are recorded against every PIN. The details of expense may include, repair team number, number of workers involved, total hours spent on pothole repair, total materials and labor expense, calendar time used etc.

It is to be noted that POL and PTL can be viewed by public but not PEL.

3. a) Give a pictorial explanation about how information from the Requirement phase, is fed to the Design phase. (4)

b) Fill up the following table regarding the type of coupling (Low Coupling, Moderate Coupling, High Coupling or Highest Coupling) for the four modules (main, AA, BB and CC) mentioned below. (4 x 3)

Modules	Type of Coupling	Possible Explanation
Main		
AA		
BB		
CC		

```
int var1, var2, var3;
```

```
int AA (int var11)
```

```
{
    int var12;
    .....
    var12=0;
    .....
    return (var12 + var11);
}
```

```
BB (int var8, int var9, int *var10_ptr)
```

```
{
    int var11;
    .....
    &var11=var10_ptr;
    .....
    var3=55 + var8 + var9 + var2;
    var11 = 45;
    .....
}
```

```
int CC (int my_flag);
```

```
{
    if ( my_flag == 1)
        return 0;
```



```

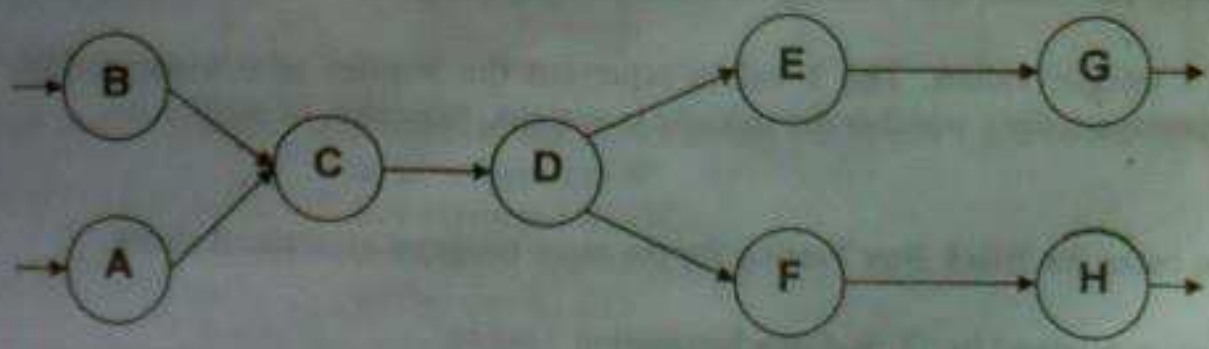
else
    return 1;
}

main ()
{
    int var4, var5, var6, var7, var13, YES_FLAG;

    .....
    .....
    var2 = AA (var4);
    .....
    var5 = var1;
    .....
    BB (var5, var6, &var7);
    .....
    .....
    YES_FLAG=0;
    var13 = CC (YES_FLAG);
}

```

c) Map the following DFD to a suitable call and return architecture. Also say clearly which mapping technique you are following. It is to be noted that data flow characteristics from C to D to E or F is quite random in nature. (4)



4. a) Regarding the topics of Interface Design Issue, please explain what do understand by "User's Memory Load Reduction" and "Interface Consistency". (6)

b) For the SafeHome (Home Security Monitoring System) problem, assume that the system is connected to the internet via a modem. Write a decision table (with regard to the component level design) based on the following facts:-

The homeowner is supposed to get an E-Mail if and only if noise level goes beyond a certain level. If the temperature of any of the rooms goes beyond a certain level (fire situation), not only homeowner will be getting an E-Mail, but also the alarm has to be switched on along with a telephone call to a local police station. As for as pressure and vibration is concerned (window breakage detected), when it goes beyond a certain level, alarm needs to be turned on along with a telephone call to a local police station.

(7)

c) Study the following program. The program has no flaw and is working alright. Try to improve the readability of the program by introducing proper indentations, comments and formatting. Since, the program is working alright, don't think about changing the logistics of the program.

```
int main ( int a,
           int b, int c )
{
    int max;
    if ( a>b )
    then max=a;
    else max=b;
    if ( max<c ) then max=c;
    printf ( "The maximum number is = %d",
            max );
}
```

(7)

5. a) Design test cases for White Box Testing for the following program :-

A program reads 3 integer values. The 3 values represent the 3 sides of a triangle. The program prints a message telling whether the triangle is scalene, isosceles, or equilateral.

b) Also, design test cases for Black Box Testing for the same program mentioned above.

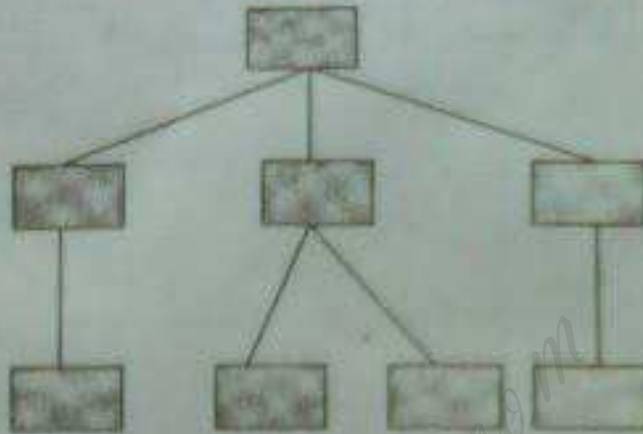
c) Explain what you understand by 'Top-down Integration Testing'.

(8 + 6 + 6)



6. a) Explain with example what you understand by "Process, Project and Product Metrics".

b) Compute the Fenton's Size Metric and the Fenton's Connectivity Density Metric for the following Call and Return Architecture.



c) Consider the following Project Data for the evaluation of the different Size Oriented Metrics.

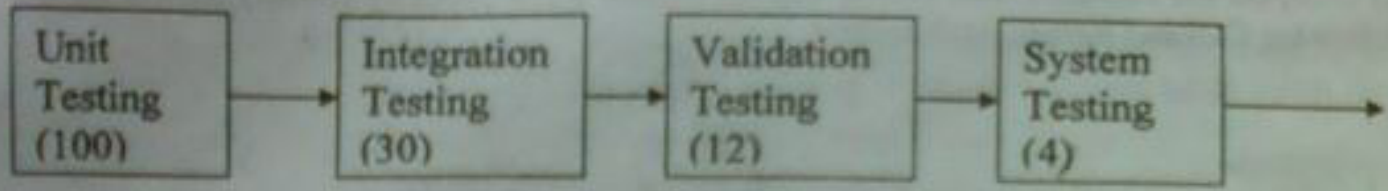
Project Name	Line of Code (LOC)	Total Effort in person-month	Cost (Lac of Rs)	Doc Produced (pages)	Errors found in test Cycle	Defects found in the field	No of persons
ALPHA (2002)	12,000	24	5	400	150	25	3
BETA (2003)	24,000	50	12	1000	250	50	6
GAMMA (2004)	18,000	33	8	800	175	30	5

Study the above table and evaluate the following 4 different types of Size Oriented Metrics:-

- Errors per KLOC
- Defects per KLOC
- Cost per KLOC (Thou)
- Doc per KLOC

d) The number of bugs found during the different testing phases is shown in the following diagram while conducting testing activity in a certain testing scenario. Compute the DRE

(Defect Removal Efficiency) for each of the testing phases. It is to be noted that, finally only one bug was found in the customer location.



(6 + 4 + 6 + 4)

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