

BITS ID:.....

Birla Institute of Technology & Science, Pilani

AY2017-2018 Semester 1

Software Engineering and Management (SS G562)

Comprehensive Examination, Dec 2017 (Partially Open Book)

Max Marks: 35

Duration: 180 Minutes

INSTRUCTIONS:

- **ALL** questions are **COMPULSORY**. The paper has total **SIX (6)** questions on **FOUR (4)** printed pages.
 - **Comprehensive Examination** contributes **35%** toward final grades of the course.
 - **ANSWER ALL PARTS OF A QUESTION TOGETHER. FOLLOW THIS INSTRUCTION STRICTLY.**
 - **DESPITE** the **CORRECTNESS** of an answer, the **QUALITY** of the answer is an **IMPORTANT EVALUATION** criterion. **Overwritten answers will not be entertained.**
 - Write your **BITS ID** on the top corner of the paper. **Don't mark/write anything on the question paper.**
 - The exam is **PARTIALLY OPEN BOOK**. **One-page single-sided handwritten A4 (black/blue ball point pen) size cheat sheet is allowed. Mention your BITS ID on your cheat sheet.**
 - Use of **RED PEN** is **STRICTLY RESTRICTED** on the answer sheets.
 - Use of **calculator is allowed.**
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1. [0.5M*4=2M] Answer the followings questions:

- (a) Which of the software size estimation metrics is/are used by Boehm in COCOMO model for estimating the nominal schedule for a project?
- (b) Mention the name of COCOMO-II model that can be used for estimating the effort required to integrate reusable or generated code.
- (c) What do you mean by the principle of phase containment of errors?
- (d) Name the plan-driven software development life cycle model that focuses on software testing to deliver a quality product at the end.

2. [1M*7=7M] Answer the followings questions. Justify your answer. Zero marks will be awarded in case of no/incomplete justification of the answer.

- (a) Being a founder of a startup organization say *BITStartup*, you need to make software effort and cost estimations for your first project. In general, there are two types of

estimation technique that can be used to do this: *Experience-based* and *Algorithmic cost modeling*. The experience-based models make estimate of the current project depending on the manager's experience of the past projects and application domain. Whereas in the algorithmic cost model approach, the manager models the estimate of project effort using a formulaic approach which is based on the estimates of product attributes such a size, project characteristics. Being a novice project manager, you decided to choose algorithmic model for the estimation. Do you opt for calibrating the chosen algorithmic model and its attributes values using your organizational historical project data? In either of the cases (whether your answer will be yes or no), how will you go for calibrating your model's attribute values? Justify your answer.

- (b) Explain the following software product metrics:
 - i. Response for a class (RFC)
 - ii. Lack of cohesion in methods (LCOM)
- (c) Identify four factors that influence the choice of a programming language. Explain why they have influence on the language selection?
- (d) A software project development involves different stakeholders such as designer, coder, tester, customer. Further, a Software Requirements Specification (SRS) document may contain a few requirements which are vague. Does the individual understanding of such requirements by different stakeholders affect software testing process? Justify with an example requirement. Zero marks will be awarded in case no justification is provided with an example.
- (e) Given that you did not have followed the Software Engineering principles properly, is a test suite of larger size always stronger than a test suite of smaller size? Justify with a programming example.
- (f) What is egoless programming? Which of the organizational team structures supports the concept of egoless programming?
- (g) You are asked to develop the graphical user interface part of a large software product. Suggest the most appropriate software development life cycle model that you would follow for developing the software. Give proper justification. Zero marks will be awarded with no justification of the answer.

3. [2M*6=12M] Answer the followings questions. Provide proper justifications. Zero marks will be awarded for no/incomplete justification of the answer.

- (a) List down the drawbacks of the Lines of Codes metric that can be handled by the Function Point (FP) Metric for software size estimation. How FP handles those drawbacks? Further, list down the drawbacks of FP Metric. Which of the size estimation metrics can be used to handle those drawbacks of the FP Metric?
- (b) List out the shortcomings of Basic COCOMO model that can be handled by Intermediate COCOMO model. Explain briefly how Intermediate COCOMO model handles those shortcomings. Since Intermediate COCOMO model can handle those

shortcomings of Basic COCOMO model, can you say that “*Basic COCOMO model is obsolete and is needed no more*”? Justify with argument.

- (c) COCOMO-II considers two types of reused code: Black-Box reuse and White-Box reuse. Explain each of them with supporting examples. How these two types of code reuse affect development effort estimation?
- (d) Software reuse is possible at a number of different levels such as the abstraction level, the object level, the component level, the system level. Explain them briefly and suggest different ways of achieving reuse at each of these levels?
- (e) Configuration control is used to handle various versions of different configuration items during the development and maintenance of a software product. With the help of a diagram, explain the various steps involved in the configuration control process.
- (f) Differentiate the following terms:
 - i. Aggregation vs. Composition
 - ii. Verification vs. Validation

4. [1+2=3M] Consider the following program:

```
int foo(int a, int b){
1  while (a!=b){
2      if (a>b) then
3          a=a-b;
4      else b=b-a;
5  }
6  return a; }
```

Generate a minimal test suite that ensures statement coverage. Does the optimal test suite generated by you ensure path coverage? Justify your answer properly. Vague justification will be awarded zero marks.

5. [1+3=4M] Briefly describe the major difference between the concept of coupling and cohesion. Which type of coupling/cohesion can be inferred from each of these specifications?
- i. Module contains the methods for computer boot-up.
 - ii. Two modules are communicating using a structure in C++.
 - iii. A module that allows lending a book. The module Name is *lendBook*. Functions in the module are: *issueBook()*, *returnBook()*, *queryBook()*, and *findBorrower()*.

Write detailed justification for your answers.

6. [7M] Draw a labeled Data Flow Diagram Model (DFD Model) with its Data Dictionary upto level-2 for the problem with following specification. Also explain each step used in drawing the DFDs.

“Suppose that you are asked to develop a Home Library Management System that following features:

The only owner of the software can use the system. For this, the owner needs to register initially in the software. The owner needs to supply his/her name, email address, and mobile number. Each registered owner is assigned a unique owner ID (OID) and password by the software system. The owner can change the password later any numbers of time. Once registered, the owner needs to register all the books in the software by entering book detail. The software system assigns a unique Book ID (BID) to the book after its registration. This number is written manually on the book by the owner. The owner can lend the book to some friends. But before allowing lending the book to a friend, the friend must be registered on the system. Upon issue of the selected book to a friend, the system should update the same in the record and send an email to the owner. If a book is returned, upon entering the detail of the book, the same should be updated in the record and a message of successful return should be displayed. Upon query, the software should display the detail of each friend against whom books are outstanding. Also, upon query, the book detail should be displayed.”

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