 **EASTERN MEDITERRANEAN UNIVERSITY**

 **COMPUTER ENGINEERING DEPARTMENT**

**CMPE 412 – SOFTWARE ENGINEERING**

**Final Exam**

**09 January 2017**

EXAM DURATION: 100 mins.

**13 students**

**Instructor: Asst.Prof.Dr.Duygu Çelik Ertuğrul**

**Nam Surname: … … … … … … …**

**Student Number: … … … … … … …**

**Group No: … … … … … …**

**Öğreti Üyesi: Yrd. Doç. Dr. Yıltan Bitirim (Gr.:01)**

|  |  |
| --- | --- |
| **QUESTION** | **GRADE** |
| **Q 1** |  |
| **Q 2** |  |
| **Q 3** |  |
| **Q 4** |  |
| **Q 5** |  |
| **Q 6** |  |
| **Q 7** |  |
| **Q 8** |  |
| **Q 9** |  |
| **Q 10** |  |
| **TOTAL** |  |

**Instructions:**

* There are **10** questions in total.
* There are two sections: ESSAY and PROBLEM SOLVING. Read instructions in Question sections.
* There are **3** pages in total.
* Calculators are allowed.
* GSM phones should be turned off and given to the invigilator.
* Passing any material including rubbers, pencils etc. to anybody else is strictly prohibited during the exam.
* Open book exam.

**I.ESSAY QUESTIONS (ESSAY part, each 10 points, total 50 points)**

**Q1. Give main sections of general format of SRS (Software Requirements Specifications) and explain the purpose of each sections in SRS in general? Why SRS is important and needed? – (briefly, max. 150-200 words),**

**SO: a2,a3,c1,c2,c3,** **k1,k2,k3 CLO: 1,2,4.**

**ANSWER:**

**1-Sections of SRS**

**i. Functional Requirements Definition**

¬ Functional requirements are a subset of the overall system requirement.

¬ These requirements are used to consider system behavior.

¬ Trade-offs may be between hardware and software issues.

**ii. Non-functional Requirements Definition**

¬ It measures the documentation and the inputs for the various requirements in the system.

**iii. System Evolution**

¬ Starting from the specification and the data base schema, on how the system should be designed.

**2-Need/Importance of SRS**

**i. What will be the business impact of the software?**

¬ The development of the software will help the company to grow on the larger perspective.

**ii. What the customer wants exactly?**

¬ The communication principles to be followed of what exactly is the requirement of the customer.

**iii. How end user will interact with the system?**

¬ Proper documentation and step by step procedure of working module of the project or the software.

**iv. Developed as a joint effort between the developer and the customer**

¬ By understanding the complete requirement, the project is developed.

**Q2. What are the steps of Requirement Development that are performed by the Requirement Engineers? Explain each of them! (briefly, max. 150 words)**

**SO: d, f1, f2, k1, k2 CLO:6**

**ANSWER:**

**Steps:**

1. Inception (Initiation): Define the scope and the nature of the problem solved.
2. Elicitation (Finding): Together with stakeholders, define which features/ functionally is required.
3. Elaboration (Classifying): Go over the initial list of requirements, decide on the final list and classify requirements.
4. Negotiation: Negotiation is needed with stakeholders.
5. Specification: Requirements specification document is produced.

**Q3. a) How the “Productivity Factor” is effected from “Number of People” in team? Why? (briefly, max. 50-100 words)**

**SO: d,f1,f2,k1,k2,b1, b3,e1,e2 CLO: 6,5.**

**ANSWER:**

* More people means more communication paths.
* Also, we can’t add people easily in later stages of the project, so we’d rather form the whole group at the beginning.



* Example: Assume that the team productivity is reduced by 250 LOC/year for every communication path. So, the total team productivity will be:
* (4 people\*5,000 LOC/year) - (6 com\*250 LOC/year) =20,000-1,500=18,500 LOC/year….1500 LOC/20.000 LOC= 0.075
* This is 7,5% less than the ‘blind’ expectation of 20,000 LOC/year.
* It can be shown by extending the project time, we can tolerate to work with fewer people.

**Q4. a) Shortly explain the difference between Testing and Quality Assurance? (briefly, max. 50 words)**

**SO:** **k1, k2, k3, c1, c2, c3, j1 CLO: 7,8.**

**ANSWER:**

Testing is done to measure the quality of a product. Whereas, Quality Assurance is done to measure the quality of process used to create a better-quality product.

**Q5. Describe what are a defect and an error? What is the differences of them? What we supposed to do to find the errors before delivery? (briefly, max. 50-100 words)**

**SO:** **c1,c2,c3,j1, k1,k2,k3 CLO: 7,8.**

**ANSWER:**

* DEFECT: The variation in the actual result and expected result can be termed as a Defect. In other terms, an **incorrect step**, **process,** or **data** definition in a computer program.
* Before the software is delivered to the customer: called as an **error**
* After delivery: **defect** or **fault**.
* In Formal Technical Reviews (FTR), we try to **find errors.**

**II. PROBLEM SOLVING QUESTIONS (total 50 pts, show each calculation steps)**

**Q6. Solve the following questions (10 points)**

1. **Find ES, EF, LF, and Slack Times for each activity?**
2. **Compute completion time of each path,**
3. **Draw a Network Diagram,**
4. **Show its Critical Path(s), and which tasks are on the Critical Path(s) for the following WBS?**

**ANSWER:**

**a)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tasks** | **Predicates** | **Estimated Duration** | **ES** | **EF** | **LF** | **Slack****Time****LF-EF** |
| **Task A** |  | **4** | **0** | **4** | **4** | **0** |
| **Task B** | **A** | **4** | **4** | **8** | **12** | **4** |
| **Task C** | **A** | **8** | **4** | **12** | **12** | **0** |
| **Task D** | **A** | **6** | **4** | **10** | **18** | **8** |
| **Task E** | **B, C** | **5** | **12** | **17** | **17** | **0** |
| **Task F** | **D** | **4** | **10** | **14** | **22** | **8** |
| **Task G** | **E** | **5** | **17** | **22** | **22** | **0** |
| **Task H** | **F, G** | **2** | **22** | **24** | **24** | **0** |

**b)**

|  |  |  |
| --- | --- | --- |
| **Paths** | **Calculation** | **Total Estimated Path Duration** |
| **ACEGH** | **4+8+5+5+2** | **24 (C.Path)** |
| **ADFH** | **4+6+4+2** | **16** |
| **ABEGH** | **4+4+5+5+2** | **20** |

**c)**

**d)**

**Critical Path: ACEGH**

**Critical Path Activities: A, C, E, G, H**

**Q7. Calculate the expected time for each activity and each path according to PERT analysis? (10 points)**

**ANSWER:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tasks** | **Predicates** | **O(min)** | **M(most likely)** | **P(max)** | **Duration(Expected Time)** |
| **Task A** |  | **2** | **4** | **6** | **4,00** |
| **Task B** | **A** | **3** | **4** | **6** | **4,17** |
| **Task C** | **A** | **4** | **8** | **10** | **7,67** |
| **Task D** | **A** | **4** | **6** | **10** | **6,33** |
| **Task E** | **B, C** | **4** | **5** | **7** | **5,17** |
| **Task F** | **D** | **3** | **4** | **8** | **4,50** |
| **Task G** | **E** | **3** | **5** | **8** | **5,17** |
| **Task H** | **F, G** | **1** | **2** | **4** | **2,17** |

|  |  |  |
| --- | --- | --- |
| **Paths** | **Duration** | **Total** |
| **ACEGH (C.Path)** | **4+7.67+5.17+5.17+2.17** | **24.18**  |
| **ADFH** | **4+6.33+4.5+2.17** | **17** |
| **ABEGH** | **4+4.17+5.17+5.17+2.17** | **20.68** |

**Q8. Draw its Network Diagram based on the Expected Time? Show its Critical Path? (10 points)**

**ANSWER:**

ES=0

EF=4

ES=4

EF=11.67

ES=4

EF=10.33

ES=4

EF=8.17

ES=10.33

EF=14.83

ES=11.67

EF=16.84

ES=16.84

EF=22.01

ES=22.01

EF=24.18

**Q9. Calculate the standard deviation and variance of each activity and path? (10 points)**

**ANSWER:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ACTIVITIES** | **Immediate Predecessors** | **Optimistic Time (a)** | **Most Likely Time (m)** | **Pessimistic Time (b)** | **Expected Value (a + 4m + b)/6** | **Variance [(b-a)/6]2** |
| **A** |  | **2** | **4** | **6** | **4,00** | **0,44** |
| **B** | **A** | **3** | **4** | **6** | **4,17** | **0,25** |
| **C** | **A** | **4** | **8** | **10** | **7,67** | **1,00** |
| **D** | **A** | **4** | **6** | **10** | **6,33** | **1,00** |
| **E** | **B, C** | **4** | **5** | **7** | **5,17** | **0,25** |
| **F** | **D** | **3** | **4** | **8** | **4,50** | **0,69** |
| **G** | **E** | **3** | **5** | **8** | **5,17** | **0,69** |
| **H** | **F, G** | **1** | **2** | **4** | **2,17** | **0,25** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Paths** | **Duration** | **Path Total Variance** | **Standard Deviation** |
| **ACEGH (C.Path)** | **0,44+1,00+0,25+0,69+0,25** | **2.63**  | **1,62** |
| **ADFH** | **0,44+1,00+0,69+0,25** | **2.38** | **1,54** |
| **ABEGH** | **0,44+0,25+0,25+0,69+0,25** | **1.88** | **1,37** |

**Q10. Calculating the probability of finishing the project in 26 weeks by using z values in Table A (below) to determine probabilities for each path? How would you interpret/explain the probability results if you were the project manager? (10 points)**

**ANSWER:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Paths** | **Path Specified Time** | **Path Expected Time** | **Standard Deviation** | **Z values** | **Probability of Finishing** |
| **ACEGH (C.Path)** | **26** | **24.18 (C.Path)** | **1,62** | **1.12** | **0.8686** |
| **ADFH** | **26** | **17** | **1,54** | **5.85** | **1.0** |
| **ABEGH** | **26** | **20.68** | **1,37** | **3.89** | **1.0** |

