Mark scored:

KATHMANDU UNIVERSITY
End Semester Examination
July, 2018

Level : B.E./B. Sc.
Year : IV
Course : COMP 486
Semester: II
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date JUL 2 9 2018

SECTION "A"
[20 Q × 0.5 = 10 marks]

Select the best answer.

1. What does the dependability of a system reflect?
   [a] It reflects the extent of the user's confidence that it will operate as users expect and that it will not 'fail' in normal use
   [b] The user's degree of trust in that system
   [c] It does not reflect the extent of the user's confidence but it reflects the operate as users expectation.
   [d] It reflects the extent of the operability of a system

2. Fails because of design and manufacturing errors or because components have reached the end of their natural life is an example of ____
   [a] Software failure
   [b] Hardware failure
   [c] Operational failure
   [d] Maintenance failure

3. What is the ability of a system to continue to deliver its services to users in the face of deliberate or accidental attack?
   [a] Availability [b] Reliability [c] Maintainability [d] Survivability

4. The probability of failure-free system operation over a specified time in a given environment for a given purpose is _____
   [a] Compatibility [b] Fault-tolerance [c] Reliability [d] Ease of operation

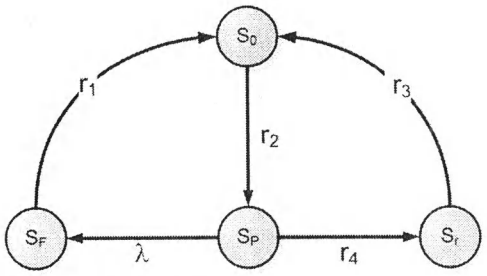
5. What is the type of fault if "*A characteristic of a software system that can lead to a system error*"?
   [a] System fault [b] Human fault [c] Machine fault [d] Design fault

6. _____ is concerned with ensuring system cannot cause damage irrespective of whether or not it conforms to its specification.
   [a] Security [b] Design [c] Safety [d] System feature

7. How does the system availability can be enhanced?
   [a] By increasing MTTF
   [b] By increasing MTTR
   [c] By increasing system delay
   [d] By increasing error free rate

8. What is Software Rejuvenation?
   [a] It is an application which is intended to run indefinitely without failure
   [b] Periodic preemptive rollback of continuously running applications to prevent failures in the future
   [c] Non-Periodic preemptive rollback of continuously running applications to prevent failures in the future
   [d] Periodic preemptive rollback in fixed routine running applications to prevent attacks in the future

9. What is the following diagram?



[a] Failure diagram
[b] Safety diagram
[c] Transition model with rejuvenation
[c] Transition model without rejuvenation

10. What are safety and dependability cases in software?
[a] Structured documents that set out detailed arguments and evidence that a required level of safety or dependability has been achieved.
[b] Unstructured documents that set out detailed arguments and evidence that a required level of safety or dependability has been achieved.
[c] Structured documents that set out the required level of safety or dependability
[d] Structured documents for dependability only

11. What type of software reuse is this "The whole of system may be reused either by incorporating it without change into other systems (COTS reuse) or by developing related families"
[a] Component Reuse
[b] Object Reuse
[c] Function Reuse
[d] Application Reuse

12. What is Design Pattern?
[a] A way of reusing abstract knowledge about a problem and its solution
[b] A way of reusing code about a problem and its solution
[c] A way of reusing application about a problem and its solution
[d] A way of reusing design about a problem and its solution

13. What is TMR (Triple Modular Redundancy)?
[a] The TMR system has three entities that work in parallel on the same input data and a voter that compare the three entities outputs: the output is equal to the majority of the three entities
[b] The TMR system has more than three entities that work in parallel on the same input data and a voter that compare the three entities outputs: the output is equal to the majority of the three entities
[c] The TMR system has three entities that work only in series not in parallel on the same input data and a voter that compare the three entities outputs: the output is equal to the majority of the three entities
[d] The TMR system has three entities that work in parallel on the different input data and a voter that compare the three entities outputs: the output is equal to the majority of the three entities

14. What is Software Fault Tolerance Technique?
[a] Techniques that are designed to allow a system to tolerate software faults that remain in the system after its development
[b] Techniques that are designed to allow a system to tolerate up to certain level only
[c] Techniques that are designed to block a system to tolerate software faults that remain in the system after its development
[d] Techniques that are designed to allow a system to tolerate software faults and attacks specially for DDoS

15. If two or more variants of software developed by different teams are used but to a common specification then_____
[a] It is the case of high dependability [b] It is the case of high security
[c] It is the case of design diversity [d] It is the case of high reliability

16. Consider the matrices:

$$\mathbf{U}=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix} \quad \mathbf{V}=\begin{bmatrix}0.32 & 0.87\\ 0.68 & 0.13\end{bmatrix} \quad \mathbf{W}=\begin{bmatrix}0.9 & 0.8\\ 0.2 & 0.1\end{bmatrix} \quad \mathbf{X}=\begin{bmatrix}0.1 & 0 & 0.1\\ 0.1 & 0.2 & 0.1\\ 0.1 & 0.1 & 0.2\end{bmatrix}$$

The matrix that could be a transition matrix for a Markov chain is:

[a] U [b] V [c] W [d] X

17. S denotes state matrix and T denotes transition matrix for Markov chain, S_{10}can be found by evaluating:

[a] $T \times S_9$ [b] $S_6 \times S_4$ [c] $T^{10} \times S_1$ [d] $T^9 \times S_0$

18. Which of the following matrix is Regular matrix?

$$\mathbf{U}=\begin{bmatrix}0.9 & 0\\ 0.1 & 1\end{bmatrix} \quad \mathbf{V}=\begin{bmatrix}0.32 & 0.50\\ 0.69 & 0.13\end{bmatrix} \quad \mathbf{W}=\begin{bmatrix}0.7 & 0.9\\ 0.2 & 0.1\end{bmatrix} \quad \mathbf{X}=\begin{bmatrix}0.1 & 0.3 & 0.2\\ 0.6 & 0.5 & 0.4\\ 0.3 & 0.2 & 0.4\end{bmatrix}$$

[a] U [b] V [c] W [d] X

19. Suppose that a two state Markov chain is defined by a transition matrix T and an initial state matrix S_0. Which of the following is a true statement?
[a] The dimension of T is 3×3 and the dimension of S_0 is 3×1.
[b] The dimension of T is 2×1 and the dimension of S_0 is 2×2.
[c] The dimension of T is 2×2 and the dimension of S_0 is 2×1.
[d] The dimension of T is 2×2 and the dimension of S_0 is 2×2.

20. Which of the following matrices are Stochastic matrices?

$$\mathbf{U}=\begin{bmatrix}0.9 & 0\\ 0.1 & 1\end{bmatrix} \quad \mathbf{V}=\begin{bmatrix}0.32 & 0.50\\ 0.69 & 0.13\end{bmatrix} \quad \mathbf{W}=\begin{bmatrix}0.7 & 0.9\\ 0.2 & 0.1\end{bmatrix} \quad \mathbf{X}=\begin{bmatrix}0.1 & 0.3 & 0.2\\ 0.6 & 0.5 & 0.4\\ 0.3 & 0.2 & 0.4\end{bmatrix}$$

[a] U & V [b] U & X [c] V & W [d] W & X

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SECTION "B"
[6Q × 4 = 24 marks]

Answer *ANY SIX* questions.

1. Compare between reparability and maintainability with examples.

2. What is "V& V" process? How does it relate to software dependability?

3. How is Safety and Reliability related to each other? Explain with examples.

4. Is high reliability always needed in software? Justify with your examples.

5. What is Fault? How does Fault Tree Analysis work?

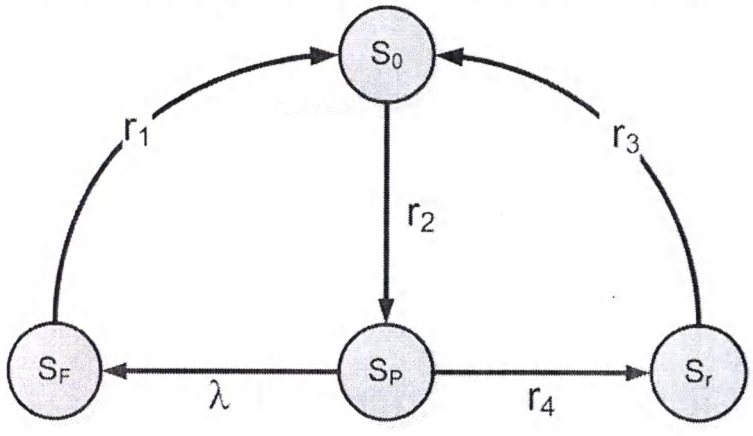
6. What are the challenges of Software Rejuvenation?

7. How can you achieve high availability in a system? Explain them with examples.

SECTION "C"
[2Q × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Find the "Healthy State" and "Down Time" of the following diagram.



9. Why is dependability important in software product? Explain the dependability properties with examples.

10. What is "Design Pattern". Explain the role of Design Pattern in making software trustworthy.