B.E. COMPUTER SCIENCE AND ENGINEERING THIRD YEAR SECOND SEMESTER – 2024

Subject: SOFTWARE ENGINEERING   **Time: Three Hours**   **Full Marks:100**

Instructions: Answer **a total of 41** questions, 40 from Group A through Group F, and 1 from GROUP-G, choosing **at least a minimum number from each group as specified below:**

Group	Minimum number of questions to be answered from group	Total number of questions to be answered
A	4	40
B	5	
C	5	
D	4	
E	10	
F	5	
G	1 (no choice)	01

GROUPs A-F   40×2=80

Choose the unique correct answer.

GROUP-A

1. For projects for which either the user requirements or the underlying technical aspects are not well understood, but all the risks can be identified before the project starts, the suitable process model is
(a) Waterfall
(b) Prototyping
(c) Spiral
(d) RAD

2. If the users are willing to become heavily involved in the use of automated tools, we can employ
(a) Waterfall
(b) Prototyping
(c) Spiral
(d) RAD

3. For projects that represent a medium to high risk, a suitable model is
(a) Waterfall
(b) Prototyping
(c) Spiral
(d) RAD

4. The following is a strength of the Prototyping Model:
(a) Quality is built in with early user involvement
(b) It makes effective use of off-the-shelf tools and frameworks
(c) It provides early indications of insurmountable risks
(d) none of the above

5. The following is a weakness of the Prototyping Model:
(a) It can fail if reusable components are not available
(b) Sometimes a system with poor performance is produced, especially if the tuning stage is skipped
(c) considerable risk assessment expertise is required
(d) none of the above

6. The most comprehensive tool for determining a software development life cycle is
(a) ISO 9001
(b) IEEE 829-1983
(c) IEEE 1074-1997
(d) IEEE 1008-1987

GROUP-B
7. In a layered design, a module is allowed to call
(a) modules at a lower layer
(b) modules at a higher layer
(c) modules in the same layer
(d) all of the above

8. Structural analysis transforms an SRS document into a
(a) Data Dictionary
(b) Context Diagram
(c) Software Architecture
(d) DFD model

9. Structured Design transforms a DFD Model into a
(a) Structure Chart
(b) Context Diagram
(c) Data Dictionary
(d) none of the above

10. The chief advantage of Object-Oriented Design is
(a) code and design reuse
(b) increased productivity
(c) ease of testing
(d) better code and design understandability

11. The commonly accepted solutions to some problems that recur during designing difficult applications are called
(a) use cases
(b) objects
(c) classes
(d) design patterns

12. A diagram which shows interaction among objects as a two-dimensional chart is called a
(a) Sequence Diagram
(b) Collaboration Diagram
(c) Activity Diagram
(d) State Chart Diagram

13. The measure of the functional strength of a module is
(a) Coupling
(b) Cohesion
(c) Modularity
(d) Efficiency

GROUP-C

For Q14..Q16: Consider the model of the Task Scheduler of an Operating System. A "New" task becomes "Ready" when it is "Admit"ted. A Ready task becomes "Running" when it is "Dispatched". A Running task is pre-empted and changes to Ready when a timer "Interrupt" occurs. A Running task changes state to "Waiting" on an "I/O event" and becomes "Terminated" on an "Exit" event. A Waiting task changes back to Ready on an "I/O over" event.

This model can be tested by using a State Transition Table. The model must consider all events, even though certain events can't occur in some states.
Let i, j, and k represent the current-state, an event, and next-state, respectively.

14. If i= Waiting, j= Admit, then k is
(a) New
(b) Ready
(c) Waiting
(d) Running

15. If i= Ready, k= Running, then j is
(a) Admit
(b) Dispatch
(c) I/O over
(d) Interrupt

16. If j= Dispatch, k= Running, then i is
(a) New
(b) Ready
(c) Running
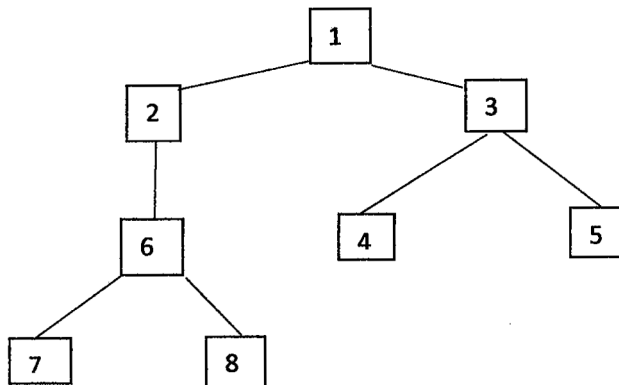(d) Waiting

17. Consider the if-condition
    If (A && B)
The test-cases
    Case-1: A = True, B = False
    Case-2: A = False, B = True
(a) achieve condition-coverage
(b) achieve decision-coverage
(c) achieve both condition coverage and decision coverage
(d) none of the above

For Q18-Q19: Consider the following hierarchy of software modules:

18. For top-down, depth-first integration, the first step requires
(a) stubs for 2 and 3
(b) stubs for 7 and 8
(c) stubs for 4 and 5
(d) stub for 6

19. For a top-down, breadth-first integration, after 1,2,3 have been integrated, stubs are required for
(a) modules 7 and 8
(b) module 5
(c) modules 4 and 5
(d) modules 6,4, and 5

20. A selective retesting of a system component is required to verify that modifications have not caused unintended effects and that the system or component still complies with its specified requirements. Such a test is called
(a) Configuration Testing
(b) Security Testing
(c) Regression Testing
(d) Installability Testing

GROUP-D
Answer the following with respect to SRS:

21. The logical characteristics of each interface between the software product and the hardware components of the system are grouped under
(a) Functional Requirements
(b) External Interface Requirements
(c) User Interfaces
(d) none of the above

22. Portability is a characteristic theat is specified under the section
(a) Functional Requirements
(b) Performance Requirements
(c) Design Constraints
(d) Quality Characteristics

23. User Characteristics are described under
(a) Introduction
(b) General Description
(c) General Constraints
(d) Functional Requirements

24. If there exists some finite cost-effective process with which a person or machine can check that the software product meets the requirement, then the SRS is
(a) Complete
(b) Traceable
(c) Verifiable
(d) Modifiable

25. If every requirement stated in the SRS is one that the software shall meet, then the SRS is
(a) Correct
(b) Unambiguous
(c) Complete
(d) Consistent

GROUP-E

For Q26-Q28: Consider a project with the following information domain characteristics:

No. of user inputs = 32
No. of user outputs = 60
No. of user inquiries = 24
No. of files = 8
No. of external interfaces = 2

Assume that all complexity adjustment values AND weighting factors are "AVERAGE".

26. The Raw Function Point Count is
(a) 374
(b) 618
(c) 896
(d) 126

27. The Complexity Adjustment Factor is
(a) 0.79
(b) 0.93
(c) 1.07
(d) 1.21

28. If the application is developed in C++ which has an average of 53 LOC per Function Point, The LOC required is
(a) 25875
(b) 30461
(c) 39632
(d) 35046

For Q29..Q31: A project of size 34,000 LOC is to be developed in the Semidetached mode of COCOMO Basic level. [1 KLOC = 1024 LOC]

29. The effort required in person-months is
(a) 151.63
(b) 94.93
(c) 240.81
(d) none of the above

30. The project duration, in months, is
(a) 12.47
(b) 16.85
(c) 14.5
(d) none of the above

31. The Productivity in KLOC per person-month is
(a) 0.35
(b) 0.219
(c) 0.138
(d) none of the above

For Q32..Q34: Consifder the following project specification:

Activity	Duration(weeks)	Precedents
A	6	
B	4	
C	3	A
D	4	B
E	3	B
F	10	
G	3	E,F
H	2	C,D

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32. For Activity-D, the latest finish date is
(a) 8
(b) 10
(c) 11
(d) 13

33. For Activity-H, the earliest start date is
(a) 10
(b) 9
(c) 6
(d) 4

34. For Activity-C, the float is
(a) 0
(b) 2
(c) 3
(d) 4

35. A risk report is discussed in weekly project status meetings. It should contain
(a) ranking of a risk item in the current week
(b) ranking from the previous week
(c) both (a) and (b)
(d) none of the above

36. The greatest risk to schedule is
(a) that schedule dates are imposed externally from the development team
(b) inadequate facilities
(c) inadequate testing
(d) none of the above

37. The Risk category "Performance" can be addressed by
(a) using code generators
(b) employing experienced people
(c) providing adequate documentation
(d) complete coverage testing of all modules and their interfaces

38. In order to reduce the risk in category "Project Management"
(a) the project manager needs domain experience
(b) a high-productivity software development team should be employed
(c) Software Maintenance should be available
(d) none of the above

GROUP-F

39. The coupling between object classes (CBO) should be
(a) high
(b) low
(c) irrelevant

40. The number of methods that can be executed in response to a message received by an object of that class is
(a) DIT (Depth of Inheritance Tree)
(b) LCOM (Lack of Cohesion Metric)
(c) RFC (Response for Class)
(d) none of the above

> **For Q41-Q42:** Answer the following with respect to the Software Capability Maturity Model (SW-CMM).

41. Basic process management processes are established to track cost, schedule, and functionality at the Maturity level named
(a) Defined
(b) Managed
(c) Optimizing
(d) Repeatable

42. The extent to which a specific process is explicitly defined, managed, measured, controlled, and effective is described by the term
(a) Software Process Capability
(b) Software Process Maturity
(c) Software Process Performance
(d) none of the above

43. The expression
$$\frac{[(No.\ of\ in-process\ defects) + (No.\ of\ customer-reported\ defects)]}{Actual\ size\ of\ the\ product}$$

is defined as
(a) Defect injection rate
(b) Defect density
(c) Defect rate
(d) Defect Removal Efficiency

44. The software quality related activities carried out to create deliverables are termed
(a) Quality Control
(b) Quality Assurance

45. The most formal review technique is
(a) Walkthrough
(b) Formal Technical Review
(c) Inspection
(d) none of the above

GROUP-G

$17 + 3 = 20$

46. Consider the following Project specification

Task	Estimated Effort (programmer days)	Actual Effort (Programmer days)	Estimated Completion Date	Actual Date Completed
1	30	37	1-Jan	1-Feb
2	25	24	15-Feb	15-Feb
3	30	41	1-Mar	15-Mar
4	50	47	15-Apr	1-Apr
5	60	63	1-May	15-Apr
6	35	31	15-May	1-Jun
7	55	58	1-Jun	1-Jun
8	30	28	15-Jun	15-Jun
9	45	43	1-Jul	15-Jul
10	25	29	1-Aug	15-Aug
11	45	49	15-Aug	1-Sep

(a) Prepare a table showing the following data at half-month intervals (1st and 15th of every month):

 (i) BCWS (Budgeted Cost of Work Scheduled);
 (ii) BCWP (Budgeted Cost of Work Petformed);
 (iii) ACWP (Actual Cost of Work Performed)
 (iv) EV (Earned Value);
 (v) SPI (Schedule Performance Index);
 (vi) SV (Schedule Variance);
 (vii) CPI (Cost Performance Index); and
 (viii) CV (Cost Variance)

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(b) Justify your answer in (a) above by explaining the table-entries of any row

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