

**MIZORAM PUBLIC SERVICE COMMISSION**

**TECHNICAL COMPETITIVE EXAMINATIONS FOR  
JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE, P&E CADRE (ELECTRICAL WING)  
UNDER POWER & ELECTRICITY DEPARTMENT,  
GOVERNMENT OF MIZORAM, JULY-2023**

**COMPUTER SCIENCE AND ENGINEERING  
PAPER-III**

Time Allowed : 3 hours

FM : 200

**SECTION - A (Multiple Choice questions) (100 Marks)**

*All questions carry equal mark of 2 each. Attempt all questions.*

*This Section should be answered only on the **OMR Response Sheet** provided.*

- In which of the following formats data is stored in the database management system?
  - Image
  - Text
  - Table
  - Graph
- Which of the following data models support for schema evaluation?
  - Relational Model
  - Entity Relationship Model
  - Object Based Data Model
  - Semi-structured Data Model
- \_\_\_\_\_ component gives an idea about all the entities available in relationship.
  - Multivalued Attribute
  - Total Participation
  - Relationship
  - Derived Attribute
- The functional dependencies is said to be \_\_\_\_\_ if it is indirectly formed by two functional Dependencies.
  - Partial Functional Dependency
  - Trivial Functional Dependency
  - Non Trivial Functional Dependency
  - Transitive Functional Dependency
- Which operation in relational algebra is denoted by sigma?
  - Project
  - Select
  - Union
  - Rename
- Which Normal is used to remove the duplicate Information?
  - First Normal Form
  - Second Normal Form
  - Third Normal Form
  - Fourth Normal Form
- Which of the following commands is used to delete all rows and free up space from a table?
  - Drop
  - Delete
  - Truncate
  - Alter
- To select some particular columns, which of the following commands is used?
  - Projection
  - Selection
  - Join
  - Union

9. A group of simple processes that can be combined to analyse a query is known as
- (a) Query Evaluation Algebra
  - (b) Query Evaluation Plan
  - (c) Query Evaluation Primitive
  - (d) Query Evaluation Engine
10. ER Diagram represents a overall \_\_\_\_\_ of a Database graphically.
- (a) Physical Structure
  - (b) Logical Structure
  - (c) Domain Structure
  - (d) Architectural Representation
11. Double rectangle representation in ER Diagram indicates
- (a) Entity Set
  - (b) Strong Entity Set
  - (c) Weak Entity Set
  - (d) Total participation
12. Consider the following transactions with data items A and B initialized to zero:
- ```
T1: read (A) ;  
    read (B) ;  
    if A = 0 then B := B + 1 ;  
    write (B) ;  
T2: read (B) ;  
    read (A) ;  
    if B = 0 then A := A + 1 ;  
    write (A) ;
```
- Any non-serial interleaving of T1 and T2 for concurrent execution leads to
- (a) A serializable schedule
  - (b) A schedule that is not conflict serializable
  - (c) A conflict serializable schedule
  - (d) A schedule for which a precedence graph cannot be drawn
13. \_\_\_\_\_ function is used to find the number of values in a column.
- (a) SUM
  - (b) COUNT
  - (c) ADD
  - (d) AVG
14. The \_\_\_\_\_ operation removes common tuples from the first relation.
- (a) Union
  - (b) Difference
  - (c) Cartesian Product
  - (d) Projection
15. Tuples can also be called
- (a) Fields
  - (b) Values
  - (c) Columns
  - (d) Records
16. When the “ROLLUP” operator for expression or columns within a “GROUP BY” clause is used?
- (a) Find the groups that make up the subtotal in a row
  - (b) Create group-wise grand totals for the groups indicated in a GROUP BY clause
  - (c) Group expressions or columns specified in a GROUP BY clause in one direction, from right to left, for computing the subtotals
  - (d) To produce a cross-tabular report for computing subtotals by grouping phrases or columns given within a GROUP BY clause in all available directions.
17. \_\_\_\_\_ resembles Create view.
- (a) Create table . . . as
  - (b) Create view as
  - (c) Create table . . .like
  - (d) With data

18. The optimizer that explores the space of all query-evaluation plans is called
- (a) Cost-based
  - (b) Plan-based
  - (c) Estimate-based
  - (d) Count-based
19. In \_\_\_\_\_ transmission, the channel capacity is shared by both communicating devices at all times.
- (a) simplex
  - (b) half-duplex
  - (c) full-duplex
  - (d) half-simplex
20. Match the following.
- |          |                       |
|----------|-----------------------|
| (P) SMTP | (1) Application layer |
| (Q) BGP  | (2) Transport layer   |
| (R) TCP  | (3) Data link layer   |
| (S) PPP  | (4) Network layer     |
|          | (5) Physical layer    |
- (a) P-2, Q-1, R-3, S-5
- (b) P-1, Q-4, R-2, S-3
- (c) P-1, Q-4, R-2, S-5
- (d) P-2, Q-4, R-1, S-3
21. After the update in the previous question, the link N1-N2 goes down. N2 will reflect this change immediately in its distance vector as cost,  $\infty$ . After the NEXT ROUND of update, what will be cost to N1 in the distance vector of N3?
- (a) 3
  - (b) 9
  - (c) 10
  - (d)  $\infty$
22. Packets of the same session may be routed through different paths in
- (a) TCP, but not UDP
  - (b) TCP and UDP
  - (c) UDP, but not TCP
  - (d) Neither TCP nor UDP
23. An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be
- (a) 255.255.0.0
  - (b) 255.255.64.0
  - (c) 255.255.128.0
  - (d) 255.255.252.0
24. Which of the following system calls results in the sending of SYN packets?
- (a) Socket
  - (b) Bind
  - (c) Listen
  - (d) connect
25. What is the maximum size of data that the application layer can pass on to the TCP layer below?
- (a) Any size
  - (b)  $2^{16}$  bytes-size of TCP header
  - (c)  $2^{16}$  bytes
  - (d) 500 bytes
26. Which one of the following uses UDP as the transport protocol?
- (a) HTTP
  - (b) Telnet
  - (c) DNS
  - (d) SMTP
27. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?
- (a) 62 subnets and 262142 hosts.
  - (b) 64 subnets and 262142 hosts.
  - (c) 62 subnets and 1022 hosts.
  - (d) 64 subnets and 1024 hosts.
28. Logical addressing system is used by which device?
- (a) Hub
  - (b) Switch
  - (c) Bridge
  - (d) Router

29. The protocol data unit(PDU) for the application layer in the Internet stack is
- (a) Segment
  - (b) Datagram
  - (c) Message
  - (d) Frame
30. Which is the applicable level protocol user in each activity?
- (a) m1:HTTP, m2:SMTP, m3:POP
  - (b) m1:SMTP, m2:FTP, m3:HTTP
  - (c) m1:SMTP, m2:POP, m3:HTTP
  - (d) m1:POP, m2:SMTP, m3:IMAP
31. The address resolution protocol (ARP) is used for
- (a) Finding the IP address from the DNS
  - (b) Finding the IP address of the default gateway
  - (c) Finding the IP address that corresponds to a MAC address
  - (d) Finding the MAC address that corresponds to an IP address
32. In a packet switching network, packets are routed from source to destination along a single path having two intermediate nodes. If the message size is 24 bytes and each packet contains a header of 3 bytes, then the optimum packet size is
- (a) 4
  - (b) 6
  - (c) 7
  - (d) 9
33. Identify the protocol primarily used for browsing data.
- (a) FTP
  - (b) TCP
  - (c) TFTP
  - (d) HTTP
34. In the slow start phase of the TCP congestion control algorithm, the size of the congestion window
- (a) does not increase
  - (b) increases linearly
  - (c) increases quadratically
  - (d) increases exponentially
35. The most important feature of spiral model is
- (a) requirement analysis.
  - (b) risk management.
  - (c) quality management.
  - (d) configuration management.
36. Which one of the following is NOT desired in a good Software Requirement Specifications (SRS) document?
- (a) Functional Requirements
  - (b) Non-Functional Requirements
  - (c) Goals of Implementation
  - (d) Algorithms for Software Implementation
37. Which of the following statements are TRUE?
- I. The context diagram should depict the system as a single bubble.
  - II. External entities should be identified clearly at all levels of DFDs.
  - III. Control information should not be represented in a DFD.
  - IV. A data store can be connected either to another data store or to an external entity.
- (a) II and III
  - (b) II and IV
  - (c) I and III
  - (d) I, II and III
38. Which one of the following is TRUE?
- (a) The requirements document also describes how the requirements that are listed in the document are implemented efficiently.
  - (b) Consistency and completeness of functional requirements are always achieved in practice.
  - (c) Prototyping is a method of requirements validation
  - (d) Requirements review is carried out to find the errors in system design

39. In the context of modular software design, which one of the following combinations is desirable?
- (a) High cohesion and high coupling
  - (b) High cohesion and low coupling
  - (c) Low cohesion and high coupling
  - (d) Low cohesion and low coupling
40. A Software Requirements Specification (SRS) document should avoid discussing which one of the following?
- (a) User interface issues
  - (b) Non-functional requirements
  - (c) Design specification
  - (d) Interfaces with third party software
41. Consider a software program that is artificially seeded with 100 faults. While testing this program, 159 faults are detected, out of which 75 faults are from those artificially seeded faults. Assuming that both real and seeded faults are of same nature and have same distribution, the estimated number of undetected real faults is
- (a) 28
  - (b) 175
  - (c) 56
  - (d) 84
42. In a software project, COCOMO (Constructive Cost Model) is used to estimate
- (a) effort and duration based on the size of the software
  - (b) size and duration based on the effort of the software
  - (c) effort and cost based on the duration of the software
  - (d) size, effort and duration based on the cost of the software
43. A software was tested using the error seeding strategy in which 20 errors were seeded in the code. When the code was tested using the complete test suite, 16 of the seeded errors were detected. The same test suite also detected 200 non-seeded errors. What is the estimated number of undetected errors in the code after this testing?
- (a) 4
  - (b) 50
  - (c) 200
  - (d) 250
44. Statistical software quality assurance in software engineering involves
- (a) using sampling in place of exhaustive testing of software.
  - (b) surveying customers to find out their opinions about product quality.
  - (c) tracing each defect to its underlying cause, isolating the vital few causes, and moving to correct them.
  - (d) tracing each defect to its underlying causes, and using the Pareto principle to correct each problem found.
45. In the Spiral model of software development, the primary determinant in selecting activities in each iteration is
- (a) Iteration size
  - (b) Cost
  - (c) Adopted process such as Rational Unified Process or Extreme Programming
  - (d) Risk
46. Testing done on development platform is
- (a) beta test
  - (b) eta test
  - (c) alpha test
  - (d) gamma test
47. Basis path testing falls under
- (a) system testing
  - (b) white box testing
  - (c) black box testing
  - (d) unit testing

48. The minimum error distribution in the period of software development is in  
(a) requirement analysis (b) design phase  
(c) coding (d) testing
49. All the modules of the system are integrated and tested as complete system in the case of  
(a) Bottom up testing (b) Top-down testing  
(c) Sandwich testing (d) Big-Bang testing
50. SRS is also known as specification of  
(a) White box testing (b) Stress testing  
(c) Integrated testing (d) Black box testing

**SECTION - B (Short answer type question) (100 Marks)**

*All questions carry equal marks of 5 each.*

*This Section should be answered only on the Answer Sheet provided.*

1. What is the difference between SQL and NoSQL?
2. Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values.

$F = \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$  is a set of functional dependencies (FDs) so that  $F^+$  is exactly the set of FDs that hold for R. How many candidate keys does the relation R have?

3. **Table A**

| Id | Name   | Age |
|----|--------|-----|
| 12 | Arun   | 60  |
| 15 | Shreya | 24  |
| 99 | Rohit  | 11  |

**Table B**

| Id | Name   | Age |
|----|--------|-----|
| 15 | Shreya | 24  |
| 25 | Hari   | 40  |
| 98 | Rohit  | 20  |
| 99 | Rohit  | 11  |

**Table C**

| Id | Phone | Area |
|----|-------|------|
| 10 | 2200  | 02   |
| 99 | 2100  | 01   |

Consider the above tables A, B and C. How many tuples does the result of the following SQL query contains?

```
SELECT A.id
FROM A
WHERE A.age > ALL (SELECT B.age
                  FROM B
                  WHERE B.name = "arun")
```

4. What do you mean by Correlated sub query?
5. List the Codd's Rules on Relational Databases.
6. Why is the multivalued, multicolumn problem another form of the multivalued dependency problem?
7. What are stored-procedures? And what are the advantages of using them?
8. What is a network and what are benefits of network?
9. Consider a source computer (S) transmitting a file of size 106 bits to a destination computer (D) over a network of two routers (R1 and R2) and three links (L1, L2 and L3). L1 connects S to R1; L2 connects R1 to R2; and L3 connects R2 to D. Let each link be of length 100km. Assume signals travel over each link at a speed of  $10^8$  meters per second. Assume that the link bandwidth on each link is 1Mbps. Let the file be broken down into 1000 packets each of size 1000 bits. Find the total sum of transmission and propagation delays in transmitting the file from S to D?
10. What are two advantage and disadvantage of STAR Topology?
11. What is Multiplexing? Briefly explain the working of Synchronous TDM.
12. Suppose the round trip propagation delay for a 10 Mbps Ethernet having 48-bit jamming signal is 46.4 ms. The minimum frame size is:
13. A computer on a 10Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2Mbps. It is initially filled to capacity with 16Megabits. What is the maximum duration for which the computer can transmit at the full 10Mbps?
14. What are the responsibilities of Application Layer?
15. How does the risk factor affect the spiral model of software development?
16. Distinguish software faults and software failures.
17. Compare the basic COCOMO model with the detailed COCOMO model.
18. A software project involves execution of 5 tasks T1, T2, T3, T4 and T5 of duration 10, 15, 18, 30 and 40 days, respectively. T2 and T4 can start only after T1 completes. T3 can start after T2 completes. T5 can start only after both T3 and T4 complete. What is the slack time of the task T3 in days?
19. Consider the following program module:

```
int module1 (int x, int y) {
    while (x != y) {
        if (x > y)
            x = x - y,
        else y = y - x;
    }
    return x;
}
```

What is Cyclomatic complexity of the above module?
20. Assume that the software team defines a project risk with 80% probability of occurrence of risk in the following manner : Only 70 percent of the software components scheduled for reuse will be integrated into the application and the remaining functionality will have to be custom developed. If 60 reusable components were planned with average component size as 100 LOC and software engineering cost for each LOC as \$ 14, then the risk exposure would be..