

TERNA PUBLIC CHARITABLE TRUST'S

TERNA ENGINEERING COLLEGE

An ISO 9001 Institution

(Approved by A.I.C.T.E. & Affiliated to University of Mumbai)

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(M.E. SAMPLE ENTRANCE TEST PAPER)

INSTRUCTIONS :

1. Use of calculator is not allowed
 2. All the questions are Compulsory
 3. All the questions carry equal marks
 4. Max. marks : 70
 5. Max. Time : One Hour and fifteen minutes.
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Q-1 Select the one true statement.

- A) Every binary tree is either complete or full.
- B) Every complete binary tree is also a full binary tree.
- C) Every full binary tree is also a complete binary tree
- D) No binary tree is both complete and full.

Q-2 Which data structure has the fastest insertion procedure?

- A) Binary search tree
- B) Ordered array
- C) Heap
- D) Unordered linked list
- E) Ordered linked list

Q-3 What are the complexities of the insert, remove and search methods of a binary search tree in the worst case?

- A) insert is $O(n)$, remove is $O(n)$, search is $O(n)$
- B) insert is $O(\log n)$, remove is $O(\log n)$, search is $O(n)$

- C) insert is $O(\log n)$, remove is $O(\log n)$, search is $O(\log n)$
- D) insert is $O(\log n)$, remove is $O(\log n)$, search is $O(1)$
- E) These methods can't be defined on a binary search tree

Q-4 This Ethernet frame type is characterized by its use of the code AA in the SAP fields.

- A) Ethernet II
- B) Ethernet RAW
- C) Ethernet 802.2
- D) Ethernet SNAP

Q-5 Which of the following are examples of routed protocols? (Choose all that apply)

- A) IP
- B) IPX
- C) RIP
- D) OSPF
- E) AppleTalk

Q-6 If switches are used to replace hubs on a network, which of the following statements is true?

- A) The number of broadcast domains will decrease
- B) The number of collision domains will increase
- C) The number of collision domains will decrease
- D) The number of broadcast domains will be zero

Q-7 Full duplex Ethernet communication is only possible when:

- A. Systems are connected to same LAN segments
- B. Systems are connected to a bridged ports
- C. Systems are connected to their own switch port
- D. Systems are running over a fiber optic connection

Q-8 SQL is the combination of

- A) DDL and DQL
- B) DDL , DML and DQL
- C) DDL,DML,DQL and DCL
- D) None of these

Q-9 Which of the following applications may use a stack?

- A) A parentheses balancing program.
- B) Keeping track of local variables at run time.
- C) Syntax analyzer for a compiler.
- D) All of the above

Q -10 Consider the implementation of the Stack using a partially-filled array. What goes wrong if we try to store the top of the Stack at location [0] and the bottom of the Stack at the last used position of the array?

- A) Both peek and pop would require linear time.
- B) Both push and pop would require linear time.
- C) The Stack could not be used to check balanced parentheses.
- D) The Stack could not be used to evaluate postfix expressions.

Q -11 Consider the following statements:

- (i) First-in-first out types of computations are efficiently supported by STACKS.
 - (ii) Implementing LISTS on linked lists is more efficient than implementing LISTS on an array for almost all the basic LIST operations.
 - (iii) Implementing QUEUES on a circular array is more efficient than implementing QUEUES on a linear array with two indices.
 - (iv) Last-in-first-out type of computations are efficiently supported by QUEUES.
- (a) (ii) and (iii) are true (b) (i) and (ii) are true
(c) (iii) and (iv) are true (d) (ii) and (iv) are true

Q -12 An advantage of chained hash table (external hashing) over the open addressing scheme is

- (a) Worst case complexity of search operations is less?
- (b) Space used is less (c) Deletion is easier
- (d) None of the above

Q -13 A CPU has a 24- bit instructions. A program starts at address 300 (in decimal).

Which of the following is a legal program counter (all values in decimal)?

- (a) 400
- (b) 500
- (c) 600
- (d) 700

Q -14 In a binary max heap containing n numbers, the smallest element can be found in time

- (a) $O(n)$
- (b) $O(\log n)$
- (c) $O(\log \log n)$
- (d) $O(1)$

Q -15 Relative mode of addressing is most relevant to writing
(a) coroutines (b) position independent code
(c) shareable code (d) interrupt handlers

Q -16 The pass numbers for each of the following activities
(i) object code generation
(ii) literals added to literal table
(iii) listing printed
(iv) address resolution of local symbols that occur in a two pass assembler
respectively are
(a) 1, 2, 1, 2 (b) 2, 1, 2, 1 (c) 2, 1, 1, 2 (d) 1, 2, 2, 2

Q -17 A critical section is a program segment
(a) which should run in a certain specified amount of time
(b) which avoids deadlocks
(c) where shared resources are accessed
(d) which must be enclosed by a pair of semaphore operations, P and V

Q -18 which of the following is an example of spooled device?
(a) A line printer used to print the output of a number of jobs.
(b) A terminal used to enter input data to a running program.
(c) A secondary storage device in a virtual memory system.
(d) A graphic display device.

Q -19 Number of machine cycles required for RET instruction in 8085 microprocessor is
(a) 1 (b) 2 (c) 3 (d) 5

Q -20 Booth's algorithm for integer multiplication gives worst performance when the multiplier pattern is
(a) 1010101010 (b) 1000000001
(c) 1111111111 (d) 0111111110

Q -21 For the daisy chain scheme of connecting I/O devices, which of the following statements is true?
(a) It gives non-uniform priority to various devices.
(b) It gives uniform priority to all devices.

- (c) It is only useful for connecting slow devices to a processor device.
- (d) It requires a separate interrupt pin on the processor for each device.

Q -22 Four jobs to be executed on a single processor system arrive at time 0 in the + order A, B, C, D. their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of A under round robin scheduling with time slice of one time unit is
(a) 10 (b) 4 (c) 8 (d) 9

Q -23 A subnet has been assigned a subnet mask of 255.255.255.192. What is the maximum number of hosts that can belong to this subnet?
A) 14
B) 30
C) 62
D) 126

Q -24 Which one of the following is NOT shared by the threads of the same process ?
A) Stack
B) Address Space
C) File Descriptor Table
D) Message Queue

Q -25 A software organization has been assessed at SEI CMM Level 4. Which of the following does the organization need to practice beside Process Change Management and Technology Change Management in order to achieve Level 5 ?
A) Defect Detection
B) Defect Prevention
C) Defect Isolation
D) Defect Propagation

Q -26 Suppose that two parties A and B wish to setup a common secret key (D-H key) between themselves using the Diffie-Hellman key exchange technique. They agree on 7 as the modulus and 3 as the primitive root. Party A chooses 2 and party B chooses 5 as their respective secrets. Their D-H key is
A) 3

- B) 4
- C) 5
- D) 6

Q -27 What is the availability of a software with the following reliability figures?
Mean Time Between Failure (MTBF) = 25 days, Mean Time To Repair (MTTR) = 6 hours

- A) 1%
- B) 24%
- C) 99%

Q -28 Consider the following relation schema pertaining to a students database: Student (rollno, name, address), Enroll (rollno, courseno, coursenam) where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student * Enroll), where '*' denotes natural join?

- A) 8, 8
- B) 120, 8
- C) 960, 8
- D) 960, 120

Q -29 The goal of structured programming is to

- A) have well indented programs
- B) be able to infer the flow of control from the compiled code
- C) be able to infer the flow of control from the program text
- D) avoid the use of GOTO statements

Q -30 How many distinct binary search trees can be created out of 4 distinct keys?

- A) 5
- B) 14
- C) 24
- D) 42

Q -31 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:

- A) 94
- B) 416

- C) 464
- D) 512

Q -32 To implement Dijkstra's shortest path algorithm on unweighted graphs so that it runs in linear

time . the data structure to be used is

- A) Queue
- B) Stack
- C) Heap
- D) B-Tree

Q -33 What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.

- (A) 2
- (B) 3
- (C) 4
- (D) 5

Q -34. In the RSA public key cryptosystem, the private and public keys are (e,n) and (d,n) respectively, where $n=p*q$ and p and q are large primes. Besides, n is public and p and q are private. Let M be an integer such that $0 < M < n$ and $\phi(n) = (p-1)(q-1)$

Now consider the following equations.

- I. $M' = Me \pmod n, M = (M')d \pmod n$
- II. $ed = 1 \pmod n$
- III $ed = 1 \pmod{\phi(n)}$
- IV $M' = Me \pmod{\phi(n)}, M = (M')d \pmod{\phi(n)}$

Which of the above equations correctly represent RSA cryptosystem?

- (A) I and II
- (B) I and III
- (C) II and IV (D) III and IV

Q -35 While opening a TCP connection, the initial sequence number is to be derived using a time-of-day (ToD) clock that keeps running even when the host is down. The low order 32 bits of the counter of the ToD clock is to be used for the initial sequence numbers. The clock counter increments once per millisecond. The maximum packet lifetime is given to be 64s. Which one of the choices given below is closest to the minimum permissible rate at which sequence numbers used for packets of a connection can increase?

- (A) 0.015/s
- (B) 0.064/s
- (C) 0.135/s
- (D) 0.327/s

Q -36 A hard disk has 63 sectors per track, 10 platters each with 2 recording surfaces and 1000 cylinders. The address of a sector is given as a triple $\langle c, h, s \rangle$ where c is the cylinder number, h is the surface number and s is the sector number. Thus, the 0th sector is addressed as $\langle 0, 0, 0 \rangle$, the 1st sector as $\langle 0, 0, 1 \rangle$, and so on. The address $\langle 400, 16, 29 \rangle$ corresponds to sector number:

- (A) 505035
- (B) 505036
- (C) 505037
- (D) 505038

Q -37 Frames of 1000 bits are sent over a 106 bps duplex link between two hosts. The propagation time is 25ms. Frames are to be transmitted into this link to maximally pack them in transit (within the link). What is the minimum number of bits (i) that will be required to represent the sequence numbers distinctly? Assume that no time gap needs to be given between transmission of two frames.

- (A) $i=2$
- (B) $i=3$
- (C) $i=4$
- (D) $i=5$

Q -38 Consider a binary max-heap implemented using an array. Which one of the following array represents a binary max-heap?

- (A) {25,12,16,13,10,8,14}
- (B) {25,14,13,16,10,8,12}
- (C) {25,14,16,13,10,8,12}
- (D) {25,14,12,13,10,8,16}

Q -39 Consider the HTML table definition given below:

```
<table border=1>
  <tr> <td rowspan=2> ab </td>
      <td colspan=2> cd </td>
  </tr>
  <tr> <td> ef </td>
      <td rowspan=2> gh </td>
  </tr>
  <tr> <td colspan=2> ik </td>
  </tr>
</table>
```

The number of rows in each column and the number of columns in each row are:

- (A) (2,2,3) and (2,3,2)

- (B) (2,2,3) and (2,2,3)
- (C) (2,3,2) and (2,3,2)
- (D) (2,3,2) and (2,2,3)

Q -40. What is the number of swaps required to sort n elements using selection sort, in the worst case?

- (A) $q(n)$
- (B) $q(n \log n)$
- (C) $q(n^2)$
- (D) $q(n^2 \log n)$

Q -41 What is the maximum size of data that the application layer can pass on to the TCP layer below?

- (A) Any size
- (B) 216 bytes-size of TCP header
- (C) 216 bytes
- (D) 1500 bytes

Q -42 A clustering index is defined on the fields which are of type

- (A) non-key and ordering
- (B) non-key and non-ordering
- (C) key and ordering
- (D) key and non-ordering

Q -43 Which of the following system calls results in the sending of SYN packets?

- (A) socket
- (B) bind
- (C) listen
- (D) connect

Q -44 The data blocks of a very large file in the Unix file system are allocated using

- (A) contiguous allocation
- (B) linked allocation
- (C) indexed allocation
- (D) an extension of indexed allocation

Q -45 The Newton-Raphson iteration $x_{n+1} = \frac{1}{2} \left(x_n + \frac{R}{x_n} \right)$

can be used to compute the

- (A) square of R
- (B) reciprocal of R
- (C) square root of R
- (D) logarithm of R

Q -46. A point on a curve is said to be an extremum if it is a local minimum or a local maximum. The number of distinct extrema for the curve $3x^4$

$- 16x^3 + 24x^2 + 37$ is

- (A) 0
- (B) 1

(C) 2

(D) 3

Q -47. Aishwarya studies either computer science or mathematics everyday. If she studies computer science on a day, then the probability that she studies mathematics the next day is 0.6. If she studies mathematics on a day, then the probability that she studies computer science the next day is 0.4. Given that Aishwarya studies computer science on Monday, what is the probability that she studies computer science on Wednesday?

(A) 0.24

(B) 0.36

(C) 0.4

(D) 0.6

Q -48 Which of the following is/are true of the auto-increment addressing mode?

I. It is useful in creating self-relocating code

II. If it is included in an Instruction Set Architecture, then an additional ALU is required for effective address calculation

III. The amount of increment depends on the size of the data item accessed

(A) I only

(B) II only

(C) III only

(D) II and III only

Q -49 Which of the following must be true for the RFE (Return From Exception) instruction on a general purpose processor?

I. It must be a trap instruction

II. It must be a privileged instruction

III. An exception cannot be allowed to occur during execution of an RFE instruction

- (A) I only
- (B) II only
- (C) I and II only
- (D) I, II and III only

Q -50 In an instruction execution pipeline, the earliest that the data TLB (Translation Lookaside Buffer) can be accessed is

- (A) Before effective address calculation has started
- (B) During effective address calculation
- (C) After effective address calculation has completed
- (D) After data cache lookup has complete