

CODE: AE-CS

M.Tech. Common Entrance Test, PGCET – 2010

**Computer Science and Engineering**

Time: 2 Hours

Max. Marks: 100

**Read the following instructions before answering the test**

- i) Write / Darken the particulars of your identity, Test Seat Number and affix your signature on the OMR Response Sheet before the start of the test.
- ii) All Questions have multiple choices of answers, of which only one is correct.
- iii) Mark the correct answer by completely darkening only one oval against the Question number using Black Ink Ball Point pen only.
- iv) There will be no negative evaluation with regard to wrong answers. Marks will not be awarded if multiple answers are given.
- v) Do not make any stray mark on the OMR Response sheet. For rough work, use blank page on the question paper.
- vi) Taking the question paper out of the test hall is permitted only after the full duration of the test.
- vii) Use of only non-programmable calculator is permitted.
- viii) **START ANSWERING ONLY AT THE SPECIFIED TIME WHEN THE INVIGILATOR GIVES INSTRUCTIONS.**

**MARKS DISTRIBUTION**

PART – I	50 Questions :	50 x 1 =	50 Marks
PART – II	25 Questions :	25 x 2 =	50 Marks
		Total =	100 Marks

## PART – I

**Each Question carries one mark**

**50 X 1 = 50 Marks**

- In a population of  $N$  families, 50% of families have three children, 30% have two children and the remaining have one child. What is the probability that a randomly picked child belongs to a family of two children?  
(a)  $3/23$       (b)  $6/23$       (c)  $3/10$       (d)  $3/5$
- Two dice are thrown simultaneously. The probability that the product of the two numbers on the dice is an even number is \_\_\_\_\_.  
(a)  $1/2$       (b)  $3/4$       (c)  $5/16$       (d)  $3/8$
- The expected value of a probability function, when probability is measured on a scale of 0 to 1, coincides with its \_\_\_\_\_.  
(a) Mean      (b) Variance      (c) Standard deviation      (d) None of them
- Which of the following is true?  
(a) The set of all rational numbers forms a group under multiplication.  
(b) The set of all matrices forms a group under multiplication.  
(c) The set of all real numbers forms a group under multiplication.  
(d) None of these.
- If  $X$  then  $Y$  unless  $Z$  is represented by which of the following?  
(a)  $(X \wedge \neg Z) \rightarrow Y$       (b)  $(X \wedge Y) \rightarrow Z$       (c)  $X \rightarrow (Y \wedge \neg Z)$       (d)  $(X \rightarrow Y) \wedge \neg Z$
- The numbers  $1, 2, \dots, n$  are inserted in a binary search tree in some order. In the resulting tree, the right subtree of the root contains  $p$  nodes. The first number to be inserted in the tree must be \_\_\_\_\_.  
(a)  $p$       (b)  $p + 1$       (c)  $n - p$       (d)  $n - p + 1$
- In the depth first traversal of a graph  $G$  with  $n$  vertices,  $k$  edges are marked as tree edges. The number of connected components in  $G$  is \_\_\_\_\_.  
(a)  $k$       (b)  $k + 1$       (c)  $n - k - 1$       (d)  $n - k$
- An abstract data type is \_\_\_\_\_.  
(a) The same as an abstract class      (b) The data type that cannot be instantiated  
(c) The data type for which only the operations defined on it can be used, but none else  
(d) All of the above
- An undirected graph  $G$  has  $n$  nodes. Its adjacency matrix is given by  $(n \times n)$  matrix, whose diagonal elements are zeros and non-diagonal elements are 1's, which one of the following is true?  
(a) The graph  $G$  has no minimal spanning tree (MST).  
(b) The graph  $G$  has unique of MST of cost  $(n - 1)$ .  
(c) The graph  $G$  has multiple distinct MSTs, each of cost  $(n - 1)$ .  
(d) The graph  $G$  has multiple MSTs of different costs.

10. The best data structure to check whether an arithmetic expression has balanced parentheses or not is a \_\_\_\_.
- (a) Queue (b) Stack (c) Tree (d) List
11. In a heap of  $n$  elements with the smallest element in the root, the 7<sup>th</sup> smallest element can be found in time \_\_\_\_.
- (a)  $\theta(n \log n)$  (b)  $\theta(n)$  (c)  $\theta(\log n)$  (d)  $\theta(1)$
12. The height of a binary tree is the maximum No. of edges in any root to leaf path. The maximum number of nodes in any binary tree of height  $h$  is \_\_\_\_.
- (a)  $2^h$  (b)  $2^{h-1} - 1$  (c)  $2^{h+1} - 1$  (d)  $2^{h+1}$
13. Which of the following sorting algorithms has the lowest worst-case complexity?
- (a) Merge sort (b) Bubble sort (c) Quick sort (d) Selection sort
14. The maximum number of edges in a  $n$ -node undirected graph without self-loops is \_\_\_\_.
- (a)  $n^2$  (b)  $n(n-1)/2$  (c)  $n-1$  (d)  $(n+1)(n)/2$
15. For merging two sorted lists of sizes  $m$  and  $n$  into a sorted list of  $(m+n)$ , we require comparisons of the order \_\_\_\_.
- (a)  $O(m)$  (b)  $O(n)$  (c)  $O(m+n)$  (d)  $O(\log m + \log n)$
16. The range of integers that can be represented by a  $n$  bit, 2's complement number system is \_\_\_\_.
- (a)  $-2^{n-1}$  to  $(2^{n-1} - 1)$  (b)  $-(2^{n-1} - 1)$  to  $(2^{n-1} - 1)$  (c)  $-2^{n-1}$  to  $2^{n-1}$  (d)  $-(2^{n-1} + 1)$  to  $(2^{n-1} - 1)$
17. The Boolean function  $x'y' + xy + x'y$  is equivalent to \_\_\_\_.
- (a)  $x'y'$  (b)  $x+y$  (c)  $x+y'$  (d)  $x'+y$
18. Which of the following addressing modes are suitable for program relocation at run time?
- (i) absolute addressing (ii) based addressing  
(iii) relative addressing (iv) indirect addressing
- (a) (i) and (iv) (b) (i) and (ii) (c) (ii) and (iii) (d) (i), (ii) and (iv)
19. Which of the following DMA transfer modes and interrupt handling mechanisms provide the highest I/O bandwidth?
- (a) Transparent DMA and polled interrupts (b) Cycle stealing and vectored interrupts  
(c) Block transfer and vectored interrupts (d) Block transfer and polled interrupts
20. The addition of the 4 bit 2's complement binary numbers 1101 and 0100 results in \_\_\_\_.
- (a) 0001 and an overflow (b) 1001 and no overflow  
(c) 0001 and no overflow (d) 1001 and an overflow
21. The grammar  $A \rightarrow AA|(A)|\epsilon$  is not suitable for predictive parsing because the grammar is \_\_\_\_.
- (a) Ambiguous (b) Left-recursive (c) Right recursive (d) An operator grammar

22. Which of the following is TRUE about the regular expression  $01^*0$ ?
- (a) It represents a finite set of finite strings      (b) It represents an infinite set of finite strings  
(c) It represents a finite set of infinite strings      (d) It represents an infinite set of infinite strings
23. Context free languages closed under \_\_\_\_\_.
- (a) Union, Intersection      (b) Union, Kleene closure  
(c) Intersection, compliment      (d) complement, Kleene closure.
24. Consider the grammar with the following productions
- $S \rightarrow a \alpha \mid b \alpha \mid c \mid Ab$   
 $S \rightarrow \alpha \mid s \mid b$   
 $S \rightarrow \alpha \mid bb \mid ab$   
 $S \alpha \rightarrow b \mid d \mid b$
- The above grammar is \_\_\_\_\_
- (a) Context free      (b) Regular      (c) Context sensitive      (d) LRCK
25. Regarding the power of recognition of languages, which of the following statements is false?
- (a) The non deterministic finite state automata are equivalent to deterministic finite state automata.  
(b) Non deterministic push down automata are equivalent to deterministic push down automata.  
(c) Non deterministic turing machines are equivalent to deterministic turing machines.  
(d) Non deterministic turing machines are equivalent to deterministic push down automata.
26. A hash table contains 10 buckets and uses linear probing to resolve collisions. The key values are integers and hash functions used is  $key \% 10$ . If the values 43, 165, 62, 123 and 142 are inserted in the table, in what location would the key value 142 be inserted?
- (a) 2      (b) 3      (c) 4      (d) 6
27. A linker is given object modules for a set of programs that were compiled separately. What information need not be included in an object module?
- (a) Object code      (b) relocation bits  
(c) Names & locations of all external symbols defined in the object module  
(d) absolute address of internal symbols
28. Relative mode of addressing is most relevant while writing \_\_\_\_\_
- (a) Co routines      (b) Position independent code      (c) Shareable code      (d) Interrupt handlers
29. Which operation does a simple two pass assembler do during the first pass?
- (a) Allocates space for literals      (b) Computes the total length of program  
(c) builds the symbol table      (d) all of the above.

30. The parsing technique that avoids back tracking is \_\_\_\_\_  
 (a) Top down parsing (b) Recursive descent parsing (c) Predictive parsing (d) both (b) and (c)
31. Test and set are used in \_\_\_\_\_  
 (a) Critical region (b) Semaphores (c) Race round (d) None of these.
32. Dijkstra's bankers' algorithm is used in the context of \_\_\_\_\_  
 (a) dead lock avoidance (b) deadlock recovery (c) mutual exclusion (d) context sustaining.
33. The concept of dirty bit for a page table \_\_\_\_\_  
 (a) helps in avoiding unnecessary writing on a paging device (b) helps to maintain LRU information  
 (c) allows only to read the page (d) none of these.
34. In which method of storage is a program placed in the largest available hole in the main memory?  
 (a) Best fit (b) First fit (c) Worst fit (d) None of these
35. The search concept used in associative memory is \_\_\_\_\_  
 (a) Parallel search (b) Sequential search (c) Binary search (d) Selective search
36. Which scheduling policy is most suitable for a time shared operating system?  
 (a) Shortest job first (b) Round Robin (c) First cum first serve (d) Longest job first.
37. For a "tuple" of a database the comparable element of algebra is \_\_\_\_\_.  
 (a) row (b) column (c) table (d) function.
38. Look at the instance of a relation R(A,B,C) below.

A	B	C
1	1	1
1	1	0
2	3	2
2	3	2

We can conclude that \_\_\_\_\_

- (a) A functionally determines B and B functionally determines C.  
 (b) A functionally determines B and B does not functionally determine C  
 (c) B does not functionally determine C  
 (d) A does not functionally determine B and B does not functionally determine C
39. Consider a schema R (A, B, C, D) and functional dependencies  $A \rightarrow B$  and  $C \rightarrow D$ . Then the decomposition of R into  $R_1(AB)$  and  $R_2(CD)$  is \_\_\_\_\_.  
 (a) Dependency preserving and lossless join (b) Lossless join but not dependency preserving  
 (c) Dependency preserving but not lossless join (d) Neither dependency preserving not lossless join

40. A relation R with an associated set of functional dependencies F is decomposed into BCNF. The redundancy in the resulting set of relations is \_\_\_\_\_.
- (a) Zero (b) More than zero, but less than that of an equivalent  
(c) Proportional to the size of F<sup>+</sup> (d) Undeterminate
41. Which normal form is considered adequate for normal relational database design?
- (a) 2NF (b) 5NF (c) 4NF (d) 3NF
42. 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
43. In TCP, a unique sequence number is assigned to each \_\_\_\_\_
- (a) Byte (b) Word (c) Segment (d) Message
44. Which one of the following statements is false?
- (a) Packet switching leads to better utilization of bandwidth than circuit switching  
(b) Packet switching results in less variation in delay than circuit switching  
(c) Packet switching needs more per packet processing than circuit switching  
(d) Packet switching can lead to reordering unlike in circuit switching
45. A sender is employing public key cryptography to send a message to the receiver. Which of the following statements are TRUE ?
- (a) Sender encrypts using receiver's public key (b) Sender encrypts using his own public key  
(c) Receiver decrypts using sender's public key (d) Receiver decrypts using his own public key
46. Count to infinity is a problem associated with \_\_\_\_\_.
- (a) Link state routing protocol (b) Distance vector routing protocol  
(c) DNS while resolving host name (d) TCP for congestion control
47. Which of the following objects can be used in expressions and scriptlets in JSP without explicitly declaring them ?
- (a) Session and request only (b) Request and response only  
(c) Response and session only (d) Session, request and response
48. What is ASP ?
- (a) It is a programming language (b) It is a package  
(c) It is a Scripting language (d) It is a testing tool

49. A HTML form is to be designed to enable purchase of office stationery. Required items are to be checked. Credit card details are to be entered and the submit button is to be pressed. Which of the following options would be appropriate to send data to the server?
- (a) GET only (b) POST only (c) either GET or POST (d) Neither GET nor POST.
50. Which of the following is TRUE only in case of XML but not HTML?
- (a) It is derived from SGML (b) It describes content and layout  
(c) It allows user defined tags (d) It is restricted only to be used with web browsers

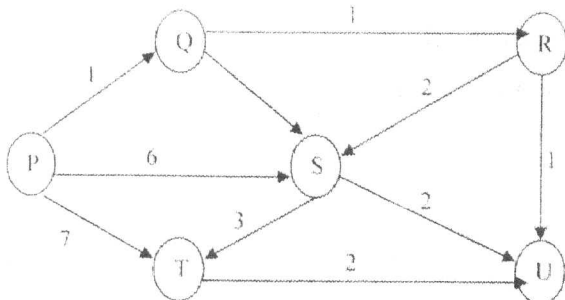
## PART – II

**Each Question carries two marks**

**25 X 2 = 50 Marks**

51. An unbiased coin is tossed repeatedly until the outcome of two successive tosses is the same. Assuming that the trials are independent, the expected number of tosses is \_\_\_\_\_
- (a) 3 (b) 4 (c) 5 (d) 6
52. Consider the following first order logic formula in which R is a binary relation symbol.  
 $\forall x \forall y y(R(x,y) \rightarrow R(y,x))$ . The formula is \_\_\_\_\_
- (a) Satisfiable and Valid (b) Satisfiable and so is its negation  
(c) Unsatisfiable but its negation is valid (d) Satisfiable but its negation is unsatisfiable.
53. It is desired to find the no. of defective chips in a computer chip production unit. Obviously the probability of finding a defective chip does not depend on whether the previous chip was defective or not. The probability distribution is \_\_\_\_\_.
- (a) binomial (b) normal (c) Uniform (d) Triangular
54. In a complete K-ary tree, every internal node has exactly K children. The number of leaves in such a tree with n internal nodes is \_\_\_\_\_
- (a) nk (b) (n-1)k+1 (c) n(k-1)+1 (d) n(k-1)
55. How many distinct binary search trees can be created out of 4 distinct keys?
- (a) 5 (b) 14 (c) 24 (d) 42

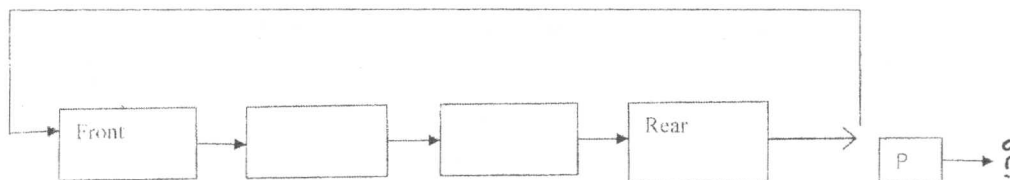
56. Suppose we run Dijkstra's single source shortest path algorithm on the following edge-weighted directed graph with vertex P as the source \_\_\_\_\_.



In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized?

- (a) P,Q,R,S,T,U (b) P,Q,R,U,S,T (c) P,Q,R,U,T,S (d) P,Q,T,R,U,S.

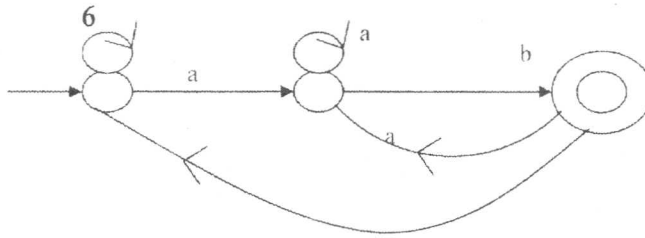
57. A circularly linked list is used to represent a queue. A single variable P is used to access the queue. To which node should P point, such that both the operations of enqueue(insert) and dequeue(delete) can be performed in constant time?



- (a) Rear Mode (b) Front Mode (c) Not possible with a single pointer (d) Node next to front
58. Let G be a directed graph whose vertex set is the set of numbers from 1 to 100. There is an edge from vertex i to vertex j if either  $j = i+1$  or  $j = 3i$ . The minimum number of edges in a path in G from vertex 1 to vertex 100 is \_\_\_\_\_
- (a) 4 (b) 7 (c) 23 (d) 99
59. Which of the following sequences of array elements forms a heap?
- (a) [23,17,14,6,13,10,1,12,7,5] (b) [23,17,14,6,13,10,1,5,7,12]  
(c) [23,17,14,7,13,10,1,5,6,12] (d) [23,17,14,7,13,10,1,12,5,7]
60. Which of the following expressions is equivalent to  $(A \oplus B) \oplus C$ ?
- (a)  $(A+B+C) (\bar{A} + \bar{B} + \bar{C})$  (b)  $(A+B+C) (\bar{A} + \bar{B} + C)$   
(c)  $ABC + \bar{A}(B \oplus C) + \bar{B}(A \oplus C)$  (d) none of these.
61. A serial transmission T1 uses 8 information bits, 2 start bits, 1 stop bit and 1 parity bit for each character. A synchronous transmission T2 uses 3 eight bit sync characters followed by 30 eight bit information characters. If the bit rate is 1200 bits/second in both, what are the transfer rates of T1 and T2?
- (a) 100 ch/sec , 153 ch/sec (b) 80 ch/sec, 136 ch/sec  
(c) 100 ch/sec, 136 ch/sec (d) 80 ch/sec, 153 ch/sec.
62. A certain processor supports only the immediate and direct addressing modes. Which of the following programming language features cannot be implemented on this processor?
- (a) Pointers (b) Arrays (c) Records (d) all of these.
63. Consider the grammar given below \_\_\_\_\_
- $S \rightarrow xB \mid yA$   
 $A \rightarrow x \mid xs \mid yAA$   
 $B \rightarrow y \mid ys \mid yBB$
- Consider the following strings:
- i) xxyyx    ii) xx yy xy    iii) xy xy    iv) yx xy
- Which of the \_\_\_\_\_ strings are generated by the grammar?
- (a) (i), (ii) and (iii) (b) (ii) (c) (ii) (iii) and iv (d) i, iii, and iv



64. If the final states and non-final states in the DFA below are interchanged, then which of the following languages over the alphabet {a,b} will be accepted by the new DFA?



- (a) Set of all strings that do not end with ab
  - (b) Set of all strings that begin with either an a or b.
  - (c) Set of all strings that do not contain the substring ab.
  - (d) The set described by the regular expression  $b^*aa^*(ba)^*b^*$ .
65. Generation of intermediate code based on an abstract machine model is useful in compilers because \_\_\_\_\_
- (a) It makes implementation of lexical analysis and syntax analysis easier
  - (b) Syntax directed translations can be written for intermediate code generation
  - (c) It enhances the portability of the front end of the compiler.
  - (d) It is not possible to generate code for real machines directly from HLL.
66. 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
67. In a multiprogramming environment a set of processes is deadlocked if each process is waiting for an event to occur that can be initiated only by another process in the set. Which of the following is Not one of the conditions necessary for dead lock to occur ?
- (a) Mutual Exclusion
  - (b) Partial assignment of resources
  - (c) Non preemption
  - (d) Process suspension.
68. The correct matching for the following pairs \_\_\_\_\_
- |                          |                |
|--------------------------|----------------|
| (A) Disk Scheduling      | 1. Round Robin |
| (B) Batch Processing     | 2. SCAN        |
| (C) Time sharing         | 3. LIFO        |
| (D) Interrupt processing | 4. FIFO        |
- (a) A-3, B-4, C-2, D-1    (b) A-4, B-3, C-2, D-1    (c) A-2, B-4, C-1, D-3    (d) A-3, B-4, C-1, D-2
69. A relation R is defined on the set of integers as  $xRy$  if  $(x+y)$  is even. Which of the following statements is true?
- (a) R is not an equivalence relation
  - (b) R is an equivalence relation having 1 equivalent class
  - (c) R is an equivalence relation having 2 equivalent class
  - (d) R is an equivalence relation having 3 equivalent class

70. A binary relation  $R = \{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2), (3,3), (3,4)\}$  on the set  $A = \{1,2,3,4\}$  is \_\_\_\_
- (a) Reflexive, symmetric and transitive  
 (b) Neither reflexive nor irreflexive but transitive  
 (c) Irreflexive, symmetric and transitive  
 (d) Irreflexive and antisymmetric
71. In a sliding window ARQ scheme, the transmitter's window size is  $N$  and the receiver's window size is  $M$ . the minimum number of distinct sequence numbers required to ensure correct operation of the ARQ scheme is \_\_\_\_
- (a)  $\text{Min}(M,N)$                       (b)  $\text{max}(M,N)$                       (c)  $M+1$                       (d)  $M,N$
72. A 20 Kbps satellite link has a propagation delay of 400 ms. The transmitter employs a "go back  $n$  ARQ" scheme with  $n$  set to 10. Assuming that each frame is 100 bytes long, what is the maximum data rate possible ?
- (a) 5 kbps                      (b) 10 kbps                      (c) 15 kbps                      (d) 20 kbps
73. A station A uses 32 byte packets to transmit message to Station B using a sliding window protocol. The round trip delay between A and B is 80 milliseconds and the bottleneck bandwidth on the path between A and B is 128 kbps. What is the optimal window size that A should use?
- (a) 20                      (b) 40                      (c) 160                      (d) 320
74. Consider the following statements \_\_\_\_\_
- (i) telnet, ftp and http are application layer protocols.  
 (ii) EJB (Enterprise Java Beans) components can be employed by J2EE (Java2 Enterprise Edition) application server  
 (iii) If two languages conform to the common language specification (CLS) of Microsoft .Net framework, then a class defined in any one of them may be inherited by the other.
- Which of them are true statements?
- (a) (i) and (ii) only                      (b) (i) and (iii) only                      (c) (ii) and (iii) only                      (d) all of them
75. Which of the following statements are true?
- (a) A computer virus infects by attaching its copies to other programs.  
 (b) A network worm enters the system as an independent program.  
 (c) Once inside a system, a worm behaves just like a virus.  
 (d) All of the above

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