B-31042(T)

Ph. D. Entrance Test, March 2010

COMPUTER ENGINEERING (UIET)

First Paper

(Descriptive Type Questions)

Time : 2 Hours   *Maximum Marks :* 100

Note : All questions are compulsory and carry equal marks. Attempt any *two* sub-questions out of three sub-questions given for each question.

1. (a) By use of a K-map, show that $f_1 = f_2$ where :

    $f_1 = A.B.C + A.B$ $f_2 = A.(B+C) = A.B + A.C$

   (b) Using 10's complement subtract 72532-3250.

   (c) When a cache is 10 times faster than main memory, and the cache can be used 90% of the time, how much speed we gain by using the cache ?

2. (a) Explain in brief PCB.

   (b) Write a note on CPU-I/O burst cycle.

   (c) Apply concurrent execution to compute
       $w = 10x + 20y + 30z$.

3. (a) The set $L = \{x \mid x$ is string of 0s and
       $|x| = $ perfect square$\}$, prove that L is not
       regular.

   (b) Construct a CFG which generates the
       precedence of the operations and
       structural rules for regular rules for
       regular expression formation.

   (c) Give regular expressions that describe the
       language generated by the grammar
       $G = (\{T, Z\}, \{a, b\}, \{Z \rightarrow aZ, Z \rightarrow bT,$
       $T \rightarrow aZ\})$.

4. (a) Calculate the total time required to read
       35 sectors on a 2-sided floppy disk.
       Assume that each track has 8 sectors and
       the track-to-track step time is 8
       milliseconds. The first sector to be read
       is 3 on track 10. Assume that the diskette
       is soft sectored and the controller has a
       1-sector buffer. The diskette spins at 300
       RPM and initially the head is on track
       10.

(b) Given a system using unspanned blocking and 100 byte blocks. A file contains record of 20, 50, 35, 70, 40, 20. What % of space will be wasted in the blocks allocated for the file ?

(c) Is it possible to have deadlock when there is only one process.

5. (a) Consider a bank database with only one relation : transaction (transno, acctno, date, amount). The amount attribute value is positive for deposits and negative for withdrawals. Define an SQL view TP containing the information – (acctno, T1.date, T2.amount) for every pair of transactions T1, T2 such that T1 ad T2 are transaction on the same account and the date of T2 is ≤ the date of T1.

(b) For relation R = (L, M, N, O, P), the following dependencies hold :

M–>O NO–>P P–>L and L–>MN

R is decomposed into R1 = (L,M,N,P) and R2=(M,O)

Is the above decomposition dependency-preserving ? If not, list all the dependencies that are not preserved.

(c) Consider the following relational database schemes :

COURSES (Cno.name), PRE-REQ(Cno, pre-Cno), COMPLETED (student-no, Cno)

COURSE gives the number and name of all available courses.

PRE-REQ gives the information about which courses are pre-requisites for a given course.

COMPLETED indicates what courses have been completed by students.

Express the following relational algebra :

List all the courses for which a student with student-no 2310 has completed all the pre-requisites.

6. (a) Consider a B-tree with degree m, that is, the number of children, c, of any internal node (except the root) is such that $m \leq c \leq 2m-1$. Derive the maximum and minimum number of records in the leaf nodes for such a B-tree with height h, $h \geq 1$. (Assume that the root of a tree is at height 0).

(b) Compute the post-fix equivalent of the following expression :

$3*\log(x+1)-(a/2)$

(c) An array contains four occurrences of 0, five occurrences of 1, and three occurrences of 2 in any order. The array is to be sorted using swap operations. Give an ordering of elements in the above array so that the minimum number of swaps needed to sort the array is maximum.

7. (a) Let F be the set of one-to-one functions from the set {1,2,......n} to the set (1,2,.....,m) where $m \geq n \geq 1$. How many functions are members of F and how many functions f in F satisfy the property $f(i) = 1$ for some, 1, $1 \leq i \leq n$?

(b) Let (A, *) be a semigroup. Furthermore, for every a and b in A, if $a \neq b$, then $a*b \neq b*a$. Show that for every a,b,c in A, $a*a=a$ and $a*b*c=a*c$.

(c) Prove that if for every element a in a group G, $a^2=e$, then G is an abelian group.

8. (a) Generate the three-address code for the following C proram :

```
Main()
{   int i =1;
    int a[10];
    while (I <=10)
    a[i]=;
}
```

(b) Construct a LR(1) parsing table for the following grammar :

T –>int

L –>L, id|id

(c) Write the syntax-directed translations to go along with the LR parser for the following :

L–>elist

elist–>elist[e] | [E]

E–>E+T |T

T–>T*F | F

F–>id

9. (a) What is the transmission rate of Ethernet LAN ? For a given transmission rate, can each user on the LAN continuously transmit at that rate ?

(b) Explain Cyclic Redundancy Check (CRC) Error detection technique.

(c) Consider a block of IP address 192.1.32.39/28. Calculate the number of addresses, first address and last address.

10. (a) Write the algorithm for rotation transformation.

(b) A rectangle is formed by four points ABCD whose co-ordinates are :

A(50, 50)   B(100,50)

C(100,80)   D(50,80)

Calculate the new co-ordinates if the rectangle is reduced in size using the scaling factors $S_x = 0.5$ and $S_y = 0.6$.

(c) Distinguish between pointing and picking.

B-31042(O)

Entrance Test, March 2010

Ph. D. Computer Engg. (UIET)

(Objective Type Questions)

Maximum Marks : 50

Time : 60 Minutes

NOTE :

(i) This question booklet comprises of 50 questions.

(ii) Each question has four options (1), (2), (3) and (4) out of which one is correct. The candidate is required to darken completely the correct option in the OMR Answer Sheet supplied separately.

(iii) Each correct answer carries 1 marks.

(iv) No negative marking.

(v) Rough work may be done in this question booklet itself.

(vi) The question booklet along with the OMR answer sheet is to be handed over by the candidate to the Invigilator at the end of the examination.

Ph. D. Entrance Test, March 2010
Computer Engineering
Second Paper
(Objective Type Questions)

1. Which logic family dissipates the minimum power ?

   (1) DTL   (2) TTL

   (3) ECL   (4) CMOS

2. Which of the following is *not* a form of memory ?

   (1) Instruction cache   (2) Instruction register

   (3) Instruction opcode   (4) Translation lookaside buffer

3. If a flip-flop is in the SET state, its Q output will be :

   (1) 0   (2) 1

   (3) Tri-stated   (4) Indeterminate

4. Which memory is non-volatile and may be written only once ?

   (1) RAM   (2) EE-ROM

   (3) EPROM   (4) PROM

5. An I/O processor controls the flow of information between :

   (1) Cache memory and I/O devices   (2) Main memory and I/O devices

   (3) Two I/O devices   (4) Cache and main memories

6. If a processor does not have any stack pointer register, then :

   (1) It cannot have subroutine call instruction

   (2) It can have subroutine call instruction, but no nested subroutine calls

   (3) Nested subroutine calls are possible but interrupts are not

   (4) All sequences of subroutine calls and also interrupts are possible

7. By default any real number in C is treated as :

(1) a float

(2) a double

(3) a long double

(4) depends upon the memory model that you are using

8. Which of the following operators in C does not associate from the left ?

(1) +   (2) ,

(3) =   (4) %

9. Stack is useful for implementing :

(1) Radix   (2) Breadth first search

(3) Recursion   (4) None of these

10. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is :

(1) $\log_2 n$ (2) n

(3) n^2 (4) 2^n

11. The worst case time complexity of binary insertion sort algorithm to sort an element is :

(1) $O(n)$ (2) $O(n \log_2 n)$

(3) $O(n^{1.2})$ (4) $O(n^2)$

12. The algorithm design technique used in the quick sort algorithm is :

(1) Dynamic programming   (2) Backtracking

(3) Divide and Conquer   (4) Greedy method

13. A hash table has space for 100 records, then the probability of collision before the table is 10% full is :

    (1) 0·45   (2) 0·5

    (3) 0·3   (4) 0·34

14. The class of context free language is not closed under :

    (1) Concatenation   (2) Intersection

    (3) Union   (4) Repeated concatenation

15. Consider two regular languages $L_1 = (a + b)*a$ and $L_2 = b (a + b)*$. The intersection of L_1 and L_2 is given by :

    (1) $(a + b)*ab$ (2) $ab (a + b)*$

    (3) $a (a + b)*b$ (4) $b (a + b)*a$

16. The number of symbols necessary to simulate a Turing machine with m symbols and n states is :

    (1) mn   (2) 2 m (n + m)

    (3) 4 mn + m   (4) 8 mn + 4m

17. Storage mapping is done by :

    (1) Operating System   (2) Compiler

    (3) Linker   (4) Loader

18. Minimum Hamming distance method is used for correction of :

    (1) Syntactic errors   (2) Semantic errors

    (3) Algorithmic errors   (4) Transcriptions errors

19. Which table is permanent databases in the general model of compiler ?

    (1) Terminal table   (2) Literal table

    (3) Identifier table   (4) Reduction

20. Memory protection is of no use in a :

(1) Single user system
(2) Non-multiprogramming system
(3) Non-multitasking system
(4) None of these

21. The first-fit, best-fit and the worst-fit algorithm can be used for :

(1) Contiguous allocation of memory
(2) Linked allocation of memory
(3) Indexed allocation of memory
(4) All of the above

22. The dirty bit is used to show the :

(1) Page with corrupted data
(2) The wrong page in the memory
(3) Page that is modified after being loaded into cache memory
(4) Page that is less frequently used

23. A system has 3 processes sharing 4 resources. If each process needs a maximum of 2 units, then :

(1) Deadlock can never occur
(2) Deadlock may occur
(3) Deadlock has to occur
(4) None of these

24. Consider a system having 'm' resources of the same type. These resources are shared by 3 processes A, B, C which have peak time demands of 3, 4, 6 respectively. The minimum value of 'm' that ensures that deadlock will never occur is :

(1) 11
(2) 12
(3) 13
(4) 14

25. A state is safe if the system can allocate resources to each process (up to its maximum) in some order and still avoid deadlock. Then :

(1) Deadlocked state is unsafe

(2) Unsafe state may lead to a deadlock situation

(3) Deadlocked state is a subset of unsafe state

(4) All of the above

26. Relocatable programs :

(1) Cannot be used with fixed partition

(2) Can be loaded almost anywhere in the memory

(3) Do not need a linker

(4) Can be loaded only at one specific location

27. Which of the following statements is false ?

(1) Segmentation suffers from external fragmentation

(2) Paging suffers from internal fragmentation

(3) Segmented memory can be paged

(4) Virtual memory is used only in multiuser systems

28. If a disk has a seek time of 20 ms, rotates 20 revolutions per second, has 100 words per block, and each track has capacity of 300 words. Then the total time required to access one block is :

(1) 25   (2) 30

(3) 40   (4) 60

29. Consider a logical address space of 8 pages of 1024 words mapped into memory of 32 frames. How many bits are there in the logical address ?

(1) 9 bits   (2) 11 bits

(3) 13 bits   (4) 15 bits

30. How many OSI layers are covered in X.25 standard ?

    (1) Two   (2) Three

    (3) Seven   (4) Six

31. FDDI is a :

    (1) Ring Network   (2) Star Network

    (3) Mesh Network   (4) Bus Network

32. Select the chip that an active Hub contains :

    (1) Multiport Repeater Chip   (2) UART

    (3) 386SX   (4) None of these

33. How many bits internet address is assigned to each host on a TCP/IP internet which is used in all communication with the host ?

    (1) 16 bits   (2) 32 bits

    (3) 48 bits   (4) 64 bits

34. Thick coax have maximum segment is :

    (1) 500 m   (2) 200 m

    (3) 100 m   (4) 2000 m

35. Embedded pointer provides :

    (1) A secondary access path   (2) A physical record key

    (3) An inverted index key   (4) All of these

36. One data dictionary software package is called :

    (1) DB/DC dictionary   (2) TOTAL

    (3) ACCESS   (4) All of these

37. The longest method of conversion is :

    (1) Direct   (2) Parallel

    (3) Pilot   (4) Phased

38. Desk chucking is involved with :

   (1) Debugging the program
   (2) Coding the program
   (3) Running the program
   (4) Compiling the program

39. A good specification should be :

   (1) Unambiguous
   (2) Distinctly specific
   (3) Functional
   (4) None of these

40. Design phase will usually be :

   (1) Top-down
   (2) Bottom-up
   (3) Random
   (4) Centrefringing

41. The error distribution in case of coding is :

   (1) 10%
   (2) 20%
   (3) 40%
   (4) 50%

42. The first AI programming language was called :

   (1) BASIC
   (2) FORTRAN
   (3) IPL
   (4) LISP

43. In a rule based system, procedural domain knowledge is in the form of :

   (1) Production rules
   (2) Rule interpreters
   (3) Meta-rules
   (4) Control rules

44. A search method that examines the values associated with the immediate successor nodes and goes to the node with the highest value is :

   (1) Sequential search
   (2) Minimal search
   (3) Hill-climbing search
   (4) Heuristic search

45. The production grammar in {S – > aSbb, S – > abb} is :

(1) type-3 grammar   (2) type-2 grammar

(3) type-1 grammar   (4) type-0 grammar

46. The domain and range and same for :

(1) Constant function   (2) Identity function

(3) Absolute value function   (4) Greatest integer function

47. Write the following statement in terms of *p*, *q*, *r* and logical connectives : Working hard is sufficient for me to be awake :

(1) $\sim r - > p$ (2) $q - > p$

(3) $r - > p$ (4) $p - > q$

48. The characteristic(s) of computer for the task "method for information input" is (are) :

(1) Large amount of input at one time by sight or hearing

(2) Sequential stylised input

(3) Informal and intuitive

(4) All of the above

49. Write a declaration for a pointer to a function that returns a float :

(1) float f ( )   (2) float *f ( )

(3) float (*f) ( )   (4) float* (*f) ( )

50. When a function is recursively called, all automatic variables :

(1) Are initialized during each execution of the function

(2) Are retained from the last execution

(3) Are maintained in the stack

(4) None of the above