Computer Science 2005

Q.1 to Q.20 carry one mark each

Q.1 What does the following C –statement declare ?

$$\text{int}(*f)(\text{int}*);$$

(A) A functions that takes an integer pointer as argument and returns an integer

(B) A function that takes an integer as argument and returns an integer pointer

(C) A pointer to a function that takes an integer pointer as argument and return an integer

(D) A function that that takes an integer pointer as argument and return an pointer

Q.2 A abstract Data Type (ADT) is

(A) same as an abstract

(B) a date type that con not be instantiated

(C) a date type for which only the operations define on it can be used, but non else

(D) all of the above

Q.3 A common property of logic programming languages and functional languages is

(A) both are procedural languages is

(B) both are based on I- calculus

(C) both are declarative

(D) both use Horn-clauses

Q.4 Which one of the following are essential features of object-oriented programming language ?

(i) Abstraction and encapsulation

(ii) Strictly-typedness

(iii) Type-safe property coupled with sub-type rule

(iv) Polymorphism in the presence of inheritance

(A) (i) and (ii) only

(B) (i) and (iv) only

(C) (i), (ii) and (iv) only

(D) (i) (iii) and (iv) only

Q.5 A program P reads in 500 integers in the range (0, 100) representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for P to store the frequencies ?

(A) An array of 50 numbers

(B) An array of 100 number

(C) An array of 500 number

(D) A dynamically allocated array of 550 numbers

Q.6 An undirected graph G has n nodes. Its adjacency matrix is given by an $n \times n$ square matrix whose

(i) diagonal element are 0's and

(ii) non-diagonal elements are 1's which one of the following is TRUE ?

(A) Graph G has no minimum spanning tree (MST)

(B) Graph G has a unique MST of cost $n-1$

(C) Graph G has multiple distinct MSTs. each of cost n-1

(D) Graph G has multiple spanning trees of different costs

Q.7 The time complexity of computing the transitive closure of a binary relation on a set of n elements is known to be

(A) $O(n)$ (B) $O(n \log n)$ (C) $O(n^{3/2})$ (D) $O(n^3)$

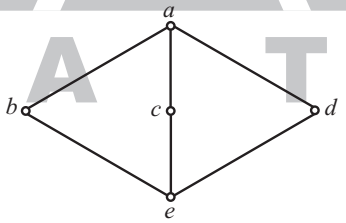
Q.8 Let A, B and C be non-empty sets and let

X = (A – B) – C and Y = (A – C) – (B – C)

Which one of the following is TRUE ?

(A) X = Y (B) $X \subset Y$ (C) $Y \subset X$ (D) None of these

Q.9 The following is the Hasse diagram of the poset $[\{a,b,c,d,e\}, \leq]$



The poset is

(A) not a lattice

(B) a lattice but not a distributive lattice

(C) a distributive lattice but not a Boolean algebra

(D) a Boolean algebra

Q.10 Let G be a simple connected planar graph with 13 vertices and 19 edges. Then, the number of faces in the planar embedding of the graph is

(A) 6 (B) 8 (C) 9 (D) 13

Q.11 Let G be a simple graph will 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is

(A) 12 (B) 8 (C) less than 8 (D) More than 12

Q.12 Let $f(x)$ be the continuous probability density function of a random variable X, The probability that $a < X \le b$ is

(A) $f(b-a)$ (B) $f(b)-f(a)$ (C) $\int_a^b f(x)dx$ (D) $\int_a^b xf(x)dx$

Q.13 The set {1, 2, 4, 7, 8, 11,13,14} is a group under multiplication modulo 15. The inverse of 4 and 7 are respectively

(A) 3 and 13 (B) 2 and 11 (C) 4 and 13 (D) 8 and 14

Q.14 The grammar $A \rightarrow AA|A|e$ is not suitable for predictive parsing because the grammar is

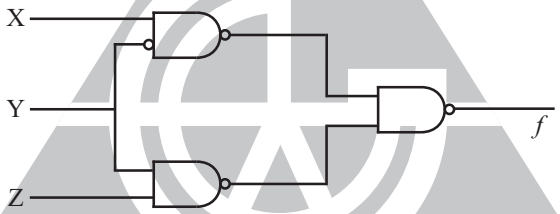
(A) ambiguous

(B) Left-recursive

(C) right recursive

(D) an operator-grammar

Q.15 Consider the following circuit.



Which on the following is TRUE ?

(A) f is independent of X

(B) f is independent of Y

(C) f is independent of Z

(D) None of X, Y, Z is redundant

Q.16 The range of integers that can be represented by an n bit 2's complements numbers 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 $2^{n-1}-1$ (D) $-(2^{n-1}+1)$ to $(2^{n-1}-1)$

Q.17 The hexadecimal representation of 657_8 is

(A) 1 AF (B) D78 (C) D71 (D) 32 F

Q.18 The switching expression corresponding to $f(A,B,C,D) = \sum(1,4,5,5,9,11,12)$ is

(A) B′C′D+ A′C′D+ AB′D (B) ABC′ + ACD+ B′C′D

(C) ACD′ + A′BC′ + AC′D′ (D) A′BD+ ACD′ + BCD′

Q.19 Which of the following is true for a CPU having a single interrupt request line and a single interrupt grant line ?

(A) Neither vectored interrupt nor multiple interrupt devices are possible

(B) Vectored interrupts are not possible but multiple interrupting devices are possible

(C) Vectored interrupts and multiple interrupting devices are both possible

(D) Vectored interrupts is possible but multiple interrupting devices are not possible

Q.20 Normally user programs are prevented from handing I/O directly by I/O instructions in them. For CPUs having explicit I/O instructions, such I/O protection is ensured by having the I/O instructions privileged. In a CPU with memory mapped I/O, there is no explicit I/O instruction. Which one of the following is true for a CPU with memory mapped I/O ?

(A) I/O protection is ensured by operating system routing (s)

(B) I/O protection is ensured by hardware trap

(C) I/O protections is ensured by during system configurations

(D) I/O protections is not possible

Q.21 What is the swap space in the disk used for ?

(A) Saving temporary html pages

(B) Saving process data

(C) Storing the super-block

(D) Storing the device drives

Q.22 Increasing the RAM of a computer typically improves performance because

(A) Virtual memory increases

(B) Larges RAMs are faster

(C) Fewer pages faults occur

(D) Fewer segmentations faults occur

Q.23 Packets of the same session may be routed through different path in

(A) TCP, but not UDP

(B) TCP, and UDP

(C) UDP, but not TCP

(D) Neither TCP, nor UDP

Q.24 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 an IP address

(D) finding the IP address that corresponds to an IP address

Q.25 The maximum of LANs connected by bridges, packets are sent from one LAN to another through intermediate bridge, Since more than one path may exist between two LAN,s, packets may have to be routed through multiple bridges. Why is the spanning tree algorithm used for bridge-routing ?

(A) 2^n (B) 2^{n-1}

(C) $2^n - 1$ (D) 2^{n-2}

Q.26 In a network of LANs connected by bridges, packets are sent from one LAN to anther through intermediate bridges. Since more than one path may exist between to LANs, packets may have to be routed through multiple bridges, Why is the spanning tree algorithm used for bridge-routing?

(A) For Shortest path routing between LANs

(B) For avoiding loops in the routing paths

(C) For fault tolerance

(D) for the minimizing collisions.

Q.27 An organization has a class B network and wishes to form subnets for the 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

Q.28 Which one of the following is a key factor for preferring B^+ – trees to binary search trees for indexing database relations ?

(A) Database relations have a large number of records

(B) Database relations are sorted on the primary

(C) B^+ – trees require less memory that binary search trees

(D) Data transfer from disks is in blocks

Q.29 Which one of the following statements about normal forms is False ?

(A) BCNF is stricter than 3 NF

(B) Lossless, dependency – preserving decomposition into 3 NF is always possible

(C) Lossless, dependency – preserving decomposition BCNF is always possible

(D) Any relations with two attributes in is BCNF

Q.30 Let r be relation instance with schema R = (A, B, C, D). We define, $r_1 = \Pi_{A,B,C}(r)$ and $r_2 = \Pi_{A,D}(r)$. Let $s = r_1 * r_2$ where * denotes natural join. Given that the decompositions of r in to r_1 and r_2 is lossy,

Which one of the following is TRUE ?

(A) $s \subset r$ (B) $r \cup s = r$

(C) $r \subset s$ (D) $r * s = s$

Q.31 to Q.80 carry one mark each

Q.31 Consider the following C- program

```
Void foo (int n, int sum) {
 Int k = 0, j = 0;
If (n = = 0) return;
k = n % 10; j = n /10
sum = sum + k;
foo (j, sum);
printf ("% d, " k);
 }
int main () {
int a = 2048, sum = 0;
foo (a, sum);
printf ("%d/n", sum);
}
```

Which does the above program print?

(A) 8, 4, 0, 2, 14 (B) 8, 4, 0, 2, 0

(C) 2, 0, 4, 8, 14 (D) 2. 0, 4, 8, 0

Q.32 Consider the following C-program

```
Double foo (double) ; /*Line 1 * /
int main () {
double da, db;
// input da,
Db= foo (da) ;
}
Double foo (double a) {
}
```

The above code compiled without any error or warning. If Line is deleted, the above code will show

(A) no compile warning or error

(B) Some compiler-warnings not leading to unintended results

(C) Some compiler – warnings due to type mis-match eventually leading to unintended results

(D) complier errors

Q.33 Postorder traversal of a given binary search, tree, T produces the followings sequence of keys

10, 9, 23, 22, 27, 25, 15, 50, 95, 60, 40, 29

Which one of the following sequence of keys can be the results of an inorder traversal of the tree T ?

(A) 9, 10, 15, 22, 23, 25, 27, 29, 40, 50, 60, 95 (B) 9, 10, 15, 22, 40, 50, 60, 95, 23, 25, 27, 29

(C) 29, 15, 9, 10, 25, 22, 23, 27, 40, 60, 50, 95 (D) 95, 50, 60, 40, 27, 23, 22, 25, 10, 9, 15, 29

Q.34 A Priority –Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below:

10, 8, 5, 3, 2

Two new elements '1' and '7' are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

(A) 10, 8, 7, 5, 3, 2, 1 (B) 10, 8, 7, 2, 3, 1, 5 (C) 10, 8, 7, 1, 2, 3, 5 (D) 10, 8, 7, 3, 2, 1, 5

Q.35 How many distinct binary search trees can be created out of 4 distinct keys?

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

Q.36 In a complete k-ary tree, ever 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) $n(k-1)$

Q.37 Suppose $T(n)=2T(n/2)+n, T(0)=T(1)=1$ Which one of the following is FALSE ?

(A) $T(n)=O(n^2)$ (B) $T(n)=\theta(n\log n)$

(C) $T(n)=\Omega(n^2)$ (D) $T(n)=O(n\log n)$

Q.38 Let G(V, E) an undirected graph with positive edge weights. Dijkstra's single-source shortest path algorithm can be single-source shortest path algorithm can be implemented using the binary heap data structure with time complexity.

(A) $O(|V|^2)$ (B) $O(|E|+|V|\log|V|)$ (C) $O(|V|\log|V|)$ (D) $O((|E|+|V|\log)|V|)$

Q.39 Suppose there are $[\log n]$ sorted lists of $[n/\log n]$ elements each. The time complexity of producing a shorted list of all these elements is :

(Hint : Use a heap data structure)

(A) $O(n\log\log n)$ (B) $\theta(n\log n)$ (C) $\Omega(n\log n)$ (D) $\Omega(n^{3/2})$

Q.40 Let P, Q and R be three atomic prepositional assertions. Let X denote $(P\vee Q)\to R$ and Y denote $(P\to Q)\vee(P\to Q)$. Which one of the followings a tautology ?

(A) X = Y (B) $X\to Y$ (C) $Y\to X$ (D) $\neg Y\to X$

Q.41 What is the first order predicate calculus statement equivalent to the following?

Every teacher is killed by some student

(A) $\forall(x)$ [teacher $(x)\to\exists(y)$ [student $(y)\to$likes (y,x)]]

(B) $\forall(x)$ [teacher $(x)\to\exists(y)$ [student $(y)\wedge$ likes (y,x)]]

(C) $\exists(y)\ \forall(x)$ [teacher $(x)\to$ [student $(y)\wedge$ likes (y,x)]]

(D) $\forall(x)$ [teacher $(x)\wedge\exists(y)$ [student $(y)\to$likes (y,x)]]

Q.42 Let R and S be any two equivalence relations on a non-empty set A. Which one of the following statements is TRUE?

(A) $R\cup S, R\cap S,$ are both equivalence relations (B) $R\cup S,$ is an equivalence

(C) $R\cap S,$ is an equivalence (D) Neither $R\cup S,$ nor $R\cap S,$ is an equivalence relations

Q.43 Let f: B → C and g: A → B be two functions and let $h = f\,o\,g$. Given that h is an onto function. Which one of the followings is TRUE?

(A) f and g should both be onto functions.

(B) f should be onto but g need not be onto

(C) g should be onto but f need not be onto

(D) both f and g need not be onto

Q.44 What is the minimum number of ordered pairs of no-negative numbers that should be chosen to ensure that there are two pairs (a,b) and (c, d) in the chosen set such that

a = c mod 3 and b= d mod 5

(A) 4 (B) 6 (C) 16 (D) 24

Q.45 Consider three decision problems P_1, P_2 and P_3, It is known that P_1, is decided and P_2 is undividable. Which one of the following is TRUE ?

(A) P_3 is decidable if P_1 is reducible to P_3

(B) P_3 is undecidable if P_3 is reducible to P_2

(C) P_3 is undecidable if P_2 is reducible to P_3

(D) P_3 is decidable if P_3 is reducible to P_2'*s* complement

Q.46 Consider the set H of all 3×3 matrices of the type

$$\begin{bmatrix} a & f & e \\ 0 & b & d \\ 0 & 0 & c \end{bmatrix}$$

Where a, b, c, d, e and f are real numbers and $abc \neq 0$. Under the matrix multiplication operation, the set H is

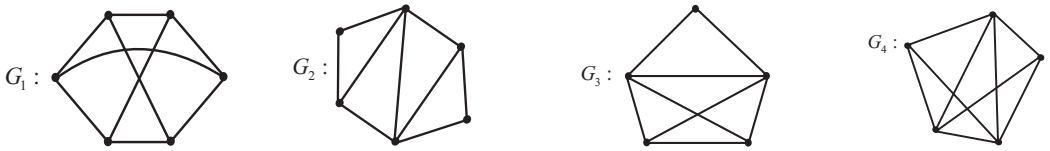
(A) a group

(B) a monoid but not a group

(C) a semigroup but not a group

(D) neither a group nor a semigroup

Q.47 Which one of the following graphs is NOT planner ?



(A) G_1 (B) G_2 (C) G_3 (D) G_4

Q.48 Consider the following system of equations in three real variables $x_1, x_2\ x_3$

$$2x_1 - x_2 + 3x_3 = 1$$

$$3x_1 - 2x_2 + 5x_3 = 2$$

$$-x_1 - 4x_2 + x_3 = 3$$

The system of equations has

(A) no solution

(B) a unique solution

(C) more than but a finite number of solution

(D) a infinite number of solutions

Q.49 What are the eigenvleus of the following 2×2 matrix?

$$\begin{bmatrix} 2 & -1 \\ -1 & 5 \end{bmatrix}$$

(A) –1 and 1 (B) 1 and 6 (C) 2 and 5 (D) 4 and –1

Q.50 Let $G(x) = 1/(1-x)^2 = \sum_{i=0}^{\infty} g(i)x^i$, where $|x| < 1$. What is $g(i)$?

(A) I (B) $i+\text{I}$ (C) $2i$ (D) 2^i

Q.51 Box P has 2 red balls and 3 blue balls and box Q has 3 red balls and 1 blue ball. A ball is selected as follows:

(i) select a box

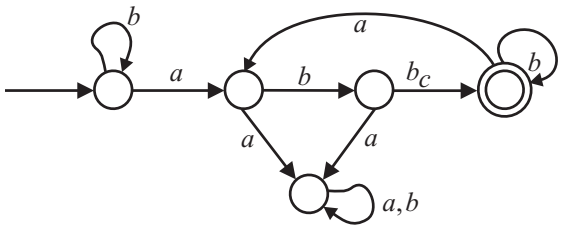
(ii) choose a ball form the select box such that each ball in the box is equally likely to be chosen. The probabilities of selecting boxes P and Q are $\frac{1}{3}$ and $\frac{2}{3}$ respectively. Given that a ball selected in the above process is a red ball, the probability that is came from the box P is

(A) $\frac{4}{19}$ (B) $\frac{5}{19}$ (C) $\frac{2}{9}$ (D) $\frac{19}{30}$

Q.52 A random bit string of length n is constructed by tossing a fair coin n times and setting a bit to 0 or 1 depending on outcomes head and tail, respectively. The probability that two such randomly generated strings are not identical is

(A) $\frac{1}{2^n}$ (B) $1-\frac{1}{n}$ (C) $\frac{1}{n}!$ (D) $1-\frac{1}{2^n}$

Q.53 Consider the machine M:



The language recognized by M is

(A) $\{w \in \{a,b\}^* / \text{every a in w is followed by exactly two b's}\}$

(B) $\{w \in \{a,b\}^* \text{every a in w is followed by least two b'}\}$

(C) $\{w \in \{a,b\}^* \text{w contains the substrzing "abb"}\}$

(D) $\{w \in \{a,b\}^* \text{w does not contains 'aa' as a substring}\}$

Q.54 Let N_f and Np denote the classes of languages accepted by non-deterministic finite automata and non-deterministic push-down automata, respectively. Let D_f and D_p denote the classes of languages accepted by deterministic finite automata and deterministic push-down automata, respectively. Which one of the followings is TRUE ?

(A) $D_f \subset N_f$ and $D_p \subset N_p$

(B) $D_f \subset N_f$ and $D_p = N_p$

(C) $D_f = N_f$ and $D_p = N_p$

(D) $D_f = N_f$ and $D_p \subset N_p$

Q.55 Consider the languages

L1= $\{a^n b^n c^m \mid n,m > 0\}$ and L2= $\{a^n b^n c^m \mid n,m > 0\}$

(A) $L_1 \cap L_2$ is a context-free languages

(B) $L_1 \cup L_2$ is a context-free languages

(C) L_1 and L_2 are context-free languages

(D) $L_1 \cap L_2$ is a context sensitive languages

Q.56 Let L_1 be a recursive languages, and let L_2 be a recursively enumerable but not a recursive language. Which one of the following is TRUE?

(A) L_1 is recursive and L_2 is recursively enumerable

(B) L_1 is recursive and L_2 is not recursively enumerable

(C) L_1 and L_2 are recursively enumerable

(D) L_1 is recursively enumerable and L_2 is recursive

Q.57 Consider the languages

$L_1 = \{ww^R \mid w \in \{0,1\}^*\}$

$L_2 = \{w \neq w^R \mid w \in \{0,1\}^*\}$ where $\neq$ is a special symbol

$L_3 = \{ww \mid w \in \{0,1\}^*\}$

Which one of the following is TRUE ?

(A) L_1 is a deterministic CFL (B) L_2 is deterministic CFL

(C) L_3 is a CFL, but not a deterministic CFL (D) L_3 is a deterministic CFL

Q.58 Consider the following two problem on undirected graphs

α : Given G (V,E), does G have an independent set of size $|V|-4$?

β : Given G (V,E), does G have an independent set of size 5 ?

Which one of the following is TRUE ?

(A) α is in P and β in NP-complete

(B) α is in NP-complete and β is in P

(C) Both α and β are NP-complete

(D) Both α and β are in P

Q.59 Consider the grammar

$E \rightarrow E + n | E \times n | n$

For the a sentence $n + n \times n$, the handles in the right sentential form of the right sentential form of the reductions are

(A) $n, E + n$ and $E + n \times n$ (B) $n, E + n$ and $E + E \times n$

(C) $n, n + n$ and $n + n \times n$ (D) $n, E + n$ and $n + E \times n$

Q.60 Consider the grammar

$S \rightarrow (S) | a$

Let the number of state in SLR (1), LR (1), and LALR (1) parsers for the grammar be n_1, n_2 and n_3 respectively. The following relationship holds good.

(A) $n_1 < n_2 < n_3$ (B) $n_1 = n_3 < n_2$ (C) $n_1 = n_2 = n_3$ (D) $n_1 \geq n_2 \geq n_3$

Q.61 Consider line number 3 of the following C program.

```
int main () {          / * Line 1*/
imt I, N;              / * Line 2*/
fro (I= 0, I < N, I + +);   / * Line3*/
}
```

Indentify the compiler's response about this line while creating the object- module

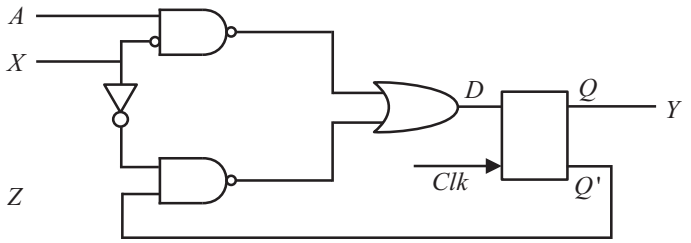
(A) No compilations error

(B) Only a lexical error

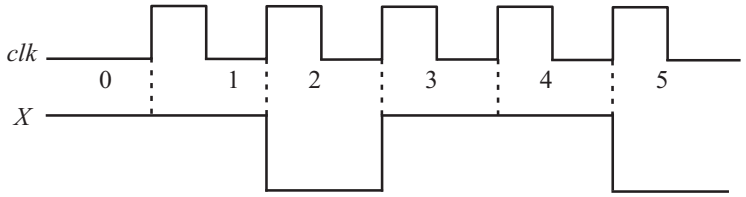
(C) Only syntactic errors

(D) Both lexical and syntactic errors

Q.62 Consider the following circuit involving a positive edge triggered D FF.



Consider the following timing diagram. Let A_i represent the logic level on the line A in the i-th clock period.



Let A′ represent the complements of A. The correct output sequence of Y over the clock periods 1 through 5 is

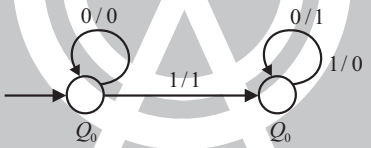
(A) $A_0A_1A_1'A_3A_4$

(B) $A_0A_1A_2'A_3A_4$

(C) $A_1A_2A_2'A_3A_4$

(D) $A_1A_2A_3'A_4A_5$

Q.63 The following diagram represent a finite state machine which takes as input a binary number from the least significant bit.



Which one of the following is TRUE ?

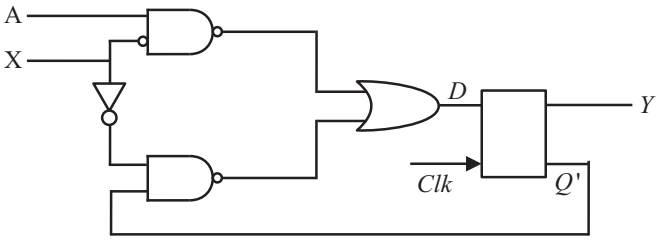
(A) It computes 1's complement of the input number

(B) It computes 2's complement of the input number

(C) It increments the input number

(D) It decrements the input number

Q.64 Consider the following circuit



The fillip-flops are positive edge triggered D FFs. Each state in designated as a two bit string Q_0Q_1. Let the initial state be 00. The state transition sequence is :

(A) $00 \rightarrow 11 \rightarrow 01$

(B) $00 \rightarrow 11$

(C) $00 \rightarrow 11 \rightarrow 01 \rightarrow 11$

(D) $00 \rightarrow 11 \rightarrow 01 \rightarrow 10$

Q.65 Consider a three word machine instructions

ADD A [R0], @ B

The first operand (destination) "A [R0]" uses indexed addressing mode with the R0 as the index register. The second operand (source) "@B" uses indirect addressing mode. A and B memory addresses residing at the second and the third wards, respectively. The first word of the instructions specifies the opcode, the index register designation and the source and destination addressing modes. During execution of ADD instruction, the two operands are added and stored in the destination (first operand).

The number of memory cycle needed during the execution cycle of the instruction is

(A) 3 (B) 4 (C) 5 (D) 6

Q.66 Match each of the high level languages statements given on the left hand side with the most natural addressing mode form those listed on the right hand side .

(1) A[1] = B[J]; (A) Indirect addressing

(2) while [*A++]; (B) Indexed addressing

(3) int temp = * x; (C) Autoincrement

(A) (1, C), (2, B), (3, A) (B) (1, A), (2, C), (3, B)

(C) (1, B), (2, C), (3, A) (D) (1, A), (2, B), (3, C)

Q.67 Consider the direct mapped cache of size 32 KB with block size 32 bytes. The CPU generates 32 bit addresses. The number of bits needed for cache indexing and the number of tag bits are respectively

(A) 10 . 17 (B) 10, 22 (C) 15, 17 (D) 5, 17

Q.68 A 5 stage pipelined CPU has the following sequence of stages:

IF – instructions fetch form instruction memory,

RD – Instruction decode and register read,

EX- Execute; ALU operation for data and address computations,

MA – Data memory access- for write access, the register read at RD stage is used,

WB – Register write back .

Consider the following sequence of instructions:

I_1 : L R0, loc 1 ; R0 <= M [loc1]

I_2 : A R0, R0 ; R0<= R0 + R0

I_3 : A R2, R0 ; R2<= R2 –R0

Let each stage take one clock cycle.

What is the number of clock cycle taken to complete the above sequence of instructions starting from the fetch of I_1 ?

(A) 8 (B) 10 (C) 12 (D) 15

Q.69 A device with data transfer rate 10 kB/sec is connected to a CPU. Data is transferred byte-wise Let the interrupt overhead by 4 msec. The byte transfer time between the device interface register and CPU or memory is negligible. What is the minimum performance gain of operating the device under interrupt mode over operating it under program controlled mode ?

(A) 15 (B) 25 (C) 35 (D) 45

Q. 70 Consider the disk with the following specifications:

16 surfaces, 512 tracks/ surface, 512 sectors/ track, 1 KB/sector, rotation speed 3000 rpm. The disk is operated in cycle stealing mode whereby whenever one byte word is ready it is sent to memory; similarly, for writing the disk interface reads a 4 byte word from the memory in each DMA cycle. Memory cycle time is 40 nsec. The maximum percentage of time that the CPU gets blocked during DMA operation is

(A) 10 (B) 25

(C) 40 (D) 50

Q.71 Suppose n process, P_1,.....P_n share m identical resource units, which can be reserved and released one at a time. The maximum resource requirement of process P_1 is S_p where $S_i > 0$. Which one of the following is a sufficient condition for ensuring that deadlock does not occur?

(A) $\forall i, s_i < m$ (B) $\forall i, s_i < n$ (C) $\sum_{i=1}^{n} s_i < (m+n)$ (D) $\sum_{i=1}^{n} s_i < (m*n)$

Q. 72 Consider the following code fragment:

if (fork () = = 0)

{ a = a + 5; print f (‘%d, %d / m’’ , a, and a); }

else { a – 5; print f (‘ % d, % d/n’’ , a, & a);

Let u n be the value of printed by the parent process, and x, y , be the value of the following is TRUE ?

(A) u = x +10 and v = y

(B) u = x +10 and $v \neq y$

(C) u + 10 = x and $v = y$

(D) u + 10 = x and $v \neq y$

Q.73 In a packets switching network, packets are routed form source to destinations along a single path having two intermediate modes. 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

Q.74 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.75 Let E_1 and E_2 be two entities in an E/R diagram with simple single-valued attributes. R_1 and R_2 are two relationships between E_1 and E_2, where R_1 is one-to-many and R_2 is many-to-many. R_1 and R_2 do not have any attributes of their own. What is the minimum number of tables required to represent his situation in the relational model ?

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

Q.76 The following table ha two attributes A and C where A is the primary key and C is the foreign key referencing A with on-delete cascade. 3

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

The set of the tuples that must be additionally deleted to preserve referential integrity when the tuple (2, 4) is deleted is:

(A) (3,4) and (6, 4)
(B) (5, 2) and (7, 2)
(C) (5, 2) (7, 2) and (9, 5)
(D) (3, 4) (3, 4) and (6, 4)

Q.77 The relations book (title, price) contains the title process of different books. Assuming that no two books have the same price, what does the following SQL

Select title
from book as B
where (select count (*)
from book as T
where T. price > B. price) < 5

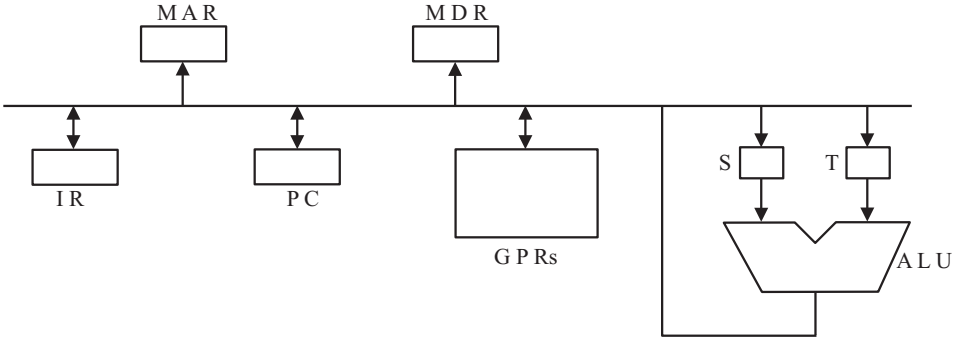
(A) Title of the four most expensive books
(B) Title of the fifth most inexpensive book
(C) Title of the fifth most expensive books
(D) Title of the five most inexpensive books

Q.78 Consider a relation scheme $R = (A, B, C, D, E, H)$ on which the following functional dependencies hold : $\{A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A\}$. What are the candidate keys of R?

(A) AE, BE
(B) AE, BE, DE
(C) AEH, BEH, BCH
(D) AEH, BEH, DEH

Common Data for Question 79, 80

Consider the following data path of a CPU



The, ALU, the bus and all the registers in the data path are of identical size. All operations including in cementations of the PC and the GPRs are to be carried out in the ALU. Two clock cycles are need for memory read operations – the first one for the loading address in the MAR and the next one for loading data from the memory bus into the MDR.

Q.79 The instruction "add R0, R1" has the register transfer the interpretation R0 < = R0 + R1. The minimum number of clock cycle needed for execution cycle of this instruction is

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

Q.80 The instructions "call Rn, sub" is a two word instruction. Assuming that PC is incremented during the fetch cycle of the first word of the instruction, its register transfer interpretation is

R_n <= PC+1;

PC <= M[PC];

The minimum number of CPU clock cycles needed during the execution cycle of this instruction is :

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

Statement For Linked Answer Questions 81 (a) & 81 (b)

Consider the following C – function :

```
double foo (int n) {
    int i;
    double sum;
if (n == 0) return 1.0;
    else {
    sum = 0.0;
for (I = 0; i< n; i++)
    sum + = foo (i);
    return sum;
}}
```

Q. 81(a) The space complexity of the above function is

(A) O(1) (B) O(n) (C) O(n!) (D) $O(n^n)$

Q.81(b) Suppose we modify the above function foo () and store the value of foo (i), 0 < = i < n , as and when they are computed. With this modification, the time complexity for function foo () is significantly reduced. The space complexity of the modified function would be:

(A) O(1) (B) O(n) (C) $O(n^n)$ (D) O(n!)

Statement For Linked Answer Questions 82 (a) & 82 (b)

Let s and t be two vertices in a undirected graph G+ (V, E) having distinct positive edge weights. Let [X,Y] be a partition of V such that $s \in$ X and $t \in$ Y. Consider the edge e having the minimum weight amongst all those edges that have one vertex in X and one vertex in Y

Q. 82 (a) The edge e must definitely belong to:

(A) the minimum weighted spanning tree of G

(B) the weighted shortest path from s to t

(C) each path from s to t

(D) the weighted longest path from s to t

Q.82 (b) Let the weigth of an edge denote the congestion on the edge. The congestion on a path is defined to be the maximum of the congestions on the edges of the path. We wish to find the path form s to t having minimum congestion. Which one of the following paths is always such a path of minimum congestion ?

(A) a path from s to t in the minimum weighted spanning tree

(B) a weighted shortest path form s to t

(C) an Euler walk from s to t

(D) a Hamiltonian path from s to t

Statement For Linked Answer Questions 83 (a) & 83 (b)

Consider the following expression grammar. The semantic for expression calculation are started next to each grammar production.

$E \rightarrow \text{number}$	E.val = number . val
$\mid E' + ' E$	$E(^{1}).\text{val} = E^{(2)}.\text{vla} + E^{(3)}.\text{val}$
$\mid E' \times ' E$	$E(^{1}).\text{val} = E^{(2)}.\text{vla} \times E^{(3)}.\text{val}$

Q.83(a) The above grammar and the semantic rules are fed to a yacc tool (Which is an LALR (1) parser generator) for parsing and valuating a arithmetic expressions. Which of the following arithmetic expressions. Which one of the following is true about the action of the given grammar?

(A) It detects recursion and eliminates recursion

(B) It detects reduce-reduce conflict, and resolves

(C) It detects shift-reduce conflict, and resolves the conflict in favor of a shift over a reduce action

(D) it detects shifts-reduce conflict, and resolves the conflict in favor of a reduce over a shift action

Q.83(b) Assume the conflicts in part (a) of this questions are resolved and an LALR (1) parser is generated for parsing arithmetic expressions as per the given grammar. Consider an expression $3 \times 2 + 1$. What precedence and associatively properties does the generated parser realize ?

(A) Equal precedence and left associatively; expression is evaluated to 7

(B) Equal precedence and right associatively; expression is evaluated to 9

(C) Precedence of 'x' is higher that of '+' , and both operators are left associative, expression is evaluated to 7

(D) Precedence of '+' is higher that of 'x' and both operators are left associative, expression is evaluated to 9

Statement For Linked Answer Questions 84 (a) & 84 (b)

Where are given 9 takes $T_1, T_2 \ldots\ldots\ldots T_9$ The executions of each task requires one unit of time. We can execute on task at a time. Each task T_i has a profit T_i has a profit P_i and a deadline D_i profit P_i is earned if the task is completed before the end of the d^{th}_i unit of time.

Task	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
Profit	15	20	30	18	18	10	23	16	25
Deadline	7	2	5	3	4	5	2	7	3

Q.84(a) Are all tasks completed in the schedule that gives maximum profit?

(A) All tasks are completed

(B) T_1 and T_6 are left out

(C) T_1 and T_8 are left out

(D) T_4 and T_6 are left out

Q.84(b) What is the maximum profit earned?

(A) 147 (B) 165 (C) 167 (C) 175

Statement For Linked Answer Questions 85 (a) & 85 (b)

Consider the following floating point format

Mantissa is a pure fraction in sing-magnitude form.

Q.85(a) The decimal number 0.239×2^{13} has the following hexadecimal representation (without normalization and rounding off:

(A) 0D 24 (B) 0D 4D (C) 4D 0D (D) 4D 3D

Q.85(b) The normalized representation for the above format is specified as follows.

The mantissa has an implicit 1 preceding the binary (radix) point. Assume that only 0's are padded in while shifting a field.

The normalized representation of the above number (0.239×2^{13}) is:

(A) 0A 20 (B) 11 34 (C) 4D D0 (D) 4A E8

END OF THE QUESTION PAPER

Gate Academy

steps to success...

Gate CS 2005

ANSWERS

1.	C	2.	C	3.	C	4.	B	5.	A	6.	C	7.	D	8.	A
9.	B	10.	B	11.	*	12.	C	13.	C	14.	A	15.	D	16.	A
17.	A	18.	A	19.	B	20.	A	21.	B	22.	C	23.	B	24.	D
25	B	26.	B	27.	D	28.	D	29.	C	30.	B	31.	D	32.	C
33.	A	34.	D	35.	B	36.	C	37.	B	38.	B	39.	A	40.	B
41.	B	42.	C	43.	B	44.	C	45.	C	46.	A	47.	A	48.	B
49.	B	50.	B	51.	*	52.	*	53.	B	54.	D	55	A	56.	B
57.	B	58.	*	59.	D	60.	B	61.	C	62.	A	63.	B	64.	D
65.	D	66.	*	67.	A	68.	B	69.	B	70.	B	71.	C	72.	D
73.	D	74.	D	75.	B	76.	C	77.	D	78.	D	79.	B	80.	B
81(a).	C	81(b).	B	82(a).	*	82(b).	*	83(a).	C	83(b).	C	84(a).	D	84(b).	A
85(a).	D	85(b).	D												

❑❑❑

Head Office : A/114-115, Smriti Nagar, Bhilai - 490 020 (C.G) ❖ Contact : 0788-4034176, 98933-68176, email : umeshdhande@gateacademy.co.in