Mock Test 5

Number of Questions: 65 **Total Marks: 100**

Wrong answer for MCQ will result in negative marks, (–1/3) for 1 Mark Questions and (–2/3) for 2 Marks Question.

General Aptitude

Number of Questions: 10 **Section Marks: 15**

Directions for question 1: Choose the most appropriate word from the options given below to complete the following sentence:

1. If I _____ you I would not have taken the help of an outsider to solve my personal problems.
(A) was (B) were
(C) am (D) will be

Directions for questions 2 and 3: Select the correct alternative form the given choices.

2. Ram and Shyam started simultaneously from two different stations towards each other with speeds of x kmph and y kmph respectively. To cross each other, Ram travelled y times the distance travelled by Shyam. If the speed of Ram is 4 kmph, then the speed (in kmph) of Shyam is _____.

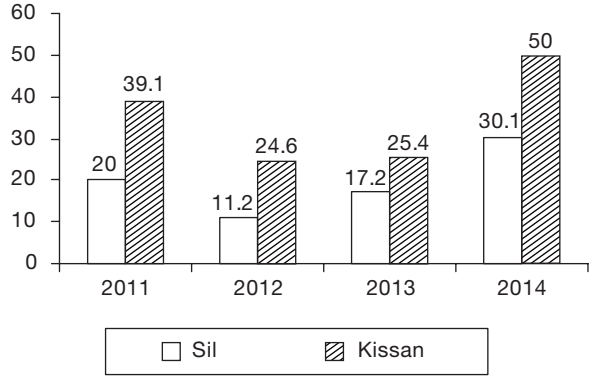
3. How is Khadar's wife's daughter's mother's daughter-in-law's husband's father related to Khadar?
(A) Grand-father (B) Father
(C) Father-in-law (D) Himself

Directions for question 4: Which one of the following combinations is incorrect?

4. (A) Beatific–Mundane
(B) Empirical–Experiential
(C) Gaunt–Emaciated
(D) Momentous–Critical

Directions for question 5: Select the correct alternative form the given choices.

5. The sales (in crores of ₹) of Kissan and Sil Mixed Fruit jams in Khaogali in each of the years from 2011 to 2014 are shown in the following bar chart.



The ratio of sales of Kissan to that of Sil is the highest in _____.
(A) 2012 (B) 2011
(C) 2013 (D) None of these

Directions for question 6: Select the alternative meaning of the underlined part of the sentence:

6. The government officials have promised the moon on the issue of regulation for industrial relations and so, have decided not to sign any new ventures.
(A) passed the buck
(B) broadened their horizons
(C) stood their ground
(D) heard something on the grapevine

Directions for question 7: The given statement is followed by some course of action. Assuming the statement to be true, decide the correct option:

7. Healthcare workers often reuse syringes or needles for multiple uses which increases the chance of infection and transmission of ailments, thus exposing people to a host of diseases from clinics, nursing homes and hospitals.
(i) Hospitals must encourage staff to incorporate smart disposal techniques.
(ii) Healthcare workers and patients must be made aware of WHO policy guidelines on safe injection practices.
(iii) Patients acquiring diseases from hospitals and nursing homes must be treated free of cost.
(iv) The government of India must make it mandatory for hospitals to switch from disposable syringes to Auto Disposable (AD) syringes.
(A) (i) and (iii) (B) (ii) and (iii)
(C) (i) and (ii) (D) (ii) and (iv)

Directions for questions 8 and 9: Select the correct alternative form the given choices.

8. Evaluate $\sqrt{5+\sqrt{5-\sqrt{5+\sqrt{5...}}}}$.
(A) $\frac{\sqrt{13}-1}{2}$ (B) $\frac{\sqrt{17}-1}{2}$
(C) $\frac{\sqrt{17}+1}{2}$ (D) $\sqrt{17}$

9. America had entered the world war since Japan had attacked Pearl Harbour.
Which one of the statements below is logically valid and can be inferred from the above sentence?

(A) Japan was feeling restless.
(B) America would not have entered the world war, if Japan would not have attacked Pearl Harbour.
(C) Japan and America are enemies.
(D) None of these

Directions for question 10: Out of the four sentences, select the most suitable sentence with respect to grammar and usage:

10. (A) Today's tip would have been sufficient to buy a full meal three years ago.
(B) Todays tip would pay for a full meal three years ago.
(C) Today's tip would be sufficient for a three- years-ago meal.
(D) A tip today would costed one a meal three years back.

Computer Science Engineering

Number of Questions: 55 **Section Marks: 85**

Directions for questions 11 to 65: Select the correct alternative from the given choices

11. The non-identity element (the element other than the identity element) which is the inverse of itself in the abelian group (G, X_7) with $G = \{1, 2, 3, 4, 5, 6\}$ under the binary operation of "multiplication module 7" is _____.

12. The value of the definite integral $\int_0^{\pi} \sin^8 x\,dx$ is_____.

(A) $\frac{7^2.5^2.3^2.1^2}{8!}\pi$ (B) $\frac{8^2.6^2.4^2.2^2}{7!}\pi$

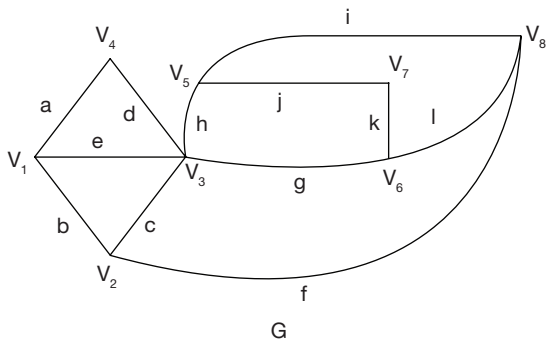
(C) $\frac{7^2.5^2 3^2.1^2}{8!}\cdot\frac{\pi}{2}$ (D) $\frac{8^2.6^2.4^2.2^2}{7!}\cdot\frac{\pi}{2}$

13. In the LU decomposition of a matrix $A = \begin{bmatrix} 3 & 1 & 2 \\ 6 & 4 & 5 \\ 9 & 7 & 11 \end{bmatrix}$ with each of the principal diagonal element of L being equal to 1, the matrix L is equal to ____.

(A) $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 1 & 3 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$

14. Consider the graph G given below:



G

Which of the following sets of edges is NOT a perfect matching of G?
(A) $\{a, c, i, k\}$ (B) $\{d, e, f, j\}$
(C) $\{b, d, j, l\}$ (D) $\{a, f, g, j\}$

15. The number of non-negative integral solutions of the inequality $x_1 + x_2 + x_3 + x_4 < 13$ is _____.

16. Consider the grammar ('X' is start symbol)
$X \rightarrow Y\,Z\,a \mid Z$
$Y \rightarrow S\,Y \mid \in$
$Z \rightarrow c \mid \in$
$S \rightarrow s \mid b$
The follow(S) is:
(A) $\{c, s, b\}$
(B) $\{s, b, \$\}$
(C) $\{s, b\}$
(D) $\{s, b, c, a\}$

17. Consider the code:
int x, y;
$x = y + 15$;
Checking the type of variable while assigning in the Code is done during:
(A) Run time
(B) Load time
(C) Compile time
(D) Link time

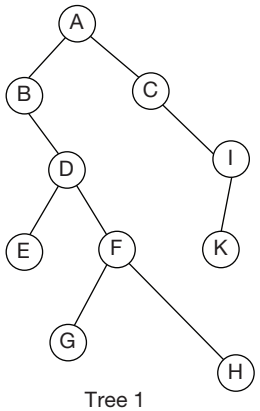
18. Consider a system with five processes and a single resource of multiple instances.

	Allocation	Maximum needed
P_1	2	4
P_2	2	3
P_3	4	10
P_4	3	8
P_5	1	6

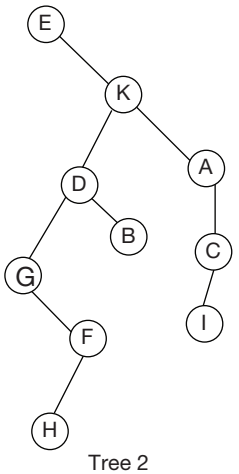
Then minimum number of resources need to be available, for the system to be in safe state is _____.

19. Consider a counting semaphore value as 25, if 33 down operations are performed followed by 40 up operations, then resultant value of semaphore is _____.

20. Consider below trees:



Tree 1



Tree 2

Which traversal of Tree 1 and Tree 2 will produce same sequence?

(A) Pre order, Post order (B) Post order, In order
(C) In order, Post order (D) Post order, Pre order

21. Number of possible permutations that can be obtained using stack if the input sequence is 1, 2, 3, 4, 5 (in the order) is _____.

22. The maximum number of elements in a heap of height 10 (Assume height of root node as 0) is _____.

23. Consider a branch predictor which uses a Branch History Table (BHT). Program Counter (PC) uses 8-bits to select the BHT entry and the history covers the last 8 branches and uses 2-bit predictor. The number of bits required for the storage of BHT is _____.

24. Consider a main memory which has 32-bit address. There is a 4-way set-associative cache. 5-bits of main memory address are used for set index and 4-bits required for Byte offset. The number of bytes required for cache data portion is _____.

25. Consider the regular expression:
$2^* (1 + \varepsilon) (01)^* (0 + \varepsilon)$,
over the alphabet $\Sigma = \{0, 1, 2\}$. Which of the following gives the language specified by given Regular expression?

(A) $\{w|$ the start and end symbols of w are not same$\}$
(B) $\{w|$ every 0 that is not right most symbol is immediately followed by a 1 and every 1 that is not right-most symbol is immediately followed by a 0$\}$
(C) $\{w|$ There is an equal number of 0's and 1's in $w\}$
(D) $\{w|$ every 0 that is not right most symbol is immediately followed by a 1$\}$

26. Which of the following language(s) is/are closed under union, intersection and complementation?

(i) Regular language
(ii) Context-free language
(iii) Recursive language
(iv) Recursively enumerable language

(A) (i) only (B) (i), (iii) only
(C) (i), (iii), (iv) only (D) (i), (ii), (iii), (iv)

27. Consider 8 stations numbered 1 to 8, whose addresses are 10101, 01100, 11101, 00010, 00101, 01010, 11100, 10011 respectively. These 8 stations want to send data through a single channel using Binary countdown protocol. Then the station which starts transmission of data out of all 8 stations is _____.

28. Using RSA public key cryptography, if $p = 7$, $q = 11$ and $d = 7$ then which of the following is a valid 'e' value?

(A) 108 (B) 170
(C) 43 (D) 10

29. Which of the following algorithms sort 'n' integers having the range (1 to n^2), in ascending order in $O(n)$ time?

(A) Radix sort (B) Selection sort
(C) Merge sort (D) Quick sort

30. Which of the following is FALSE about Weak Entity?

I. A Weak Entity set has no primary keys unless attributes of the strong entity set on which it depends are included.
II. Weak entities can be deleted automatically when their strong entity is deleted.

(A) I only (B) II only
(C) Both I and II (D) Neither I nor II

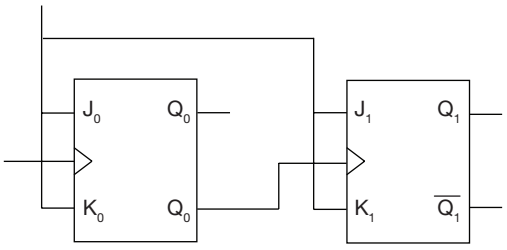
31. Which of the following is asymptotically smaller?

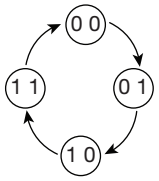
(A) $\log_2 (n!)$ (B) $\log_2 (\log n)$
(C) $\log (\log n^2)$ (D) $\log (\log_2 n!)$

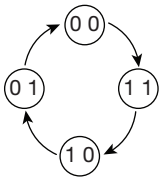
32. $\pi_A (\sigma_B (R \times S))$ is equivalent to which of the following?

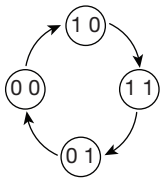
(A) Select A
From R, S
Where B
(B) Select DISTINCT(A)
From $R \times S$
Where B
(C) Select DISTINCT(A)
From R, S
Where B
(D) All the above

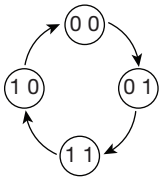
33. For the counter shown in figure, find the state diagram for the states $Q_1\ Q_0$?



(A) 

(B) 

(C) 

(D) 

34. Consider the following Relation:
CREATE TABLE Authoring
(ArticleID INT REFERENCES Article(ID) ON DELETE SET NULL
AuthorID INT REFERENCES Author(ID) ON DELETE CASCADE)

I. If we delete a tuple from Article, some attributes of Authoring may have their values SET to NULL.

II. If we delete a tuple from Authoring, any tuples in Author referred to by this tuple are also deleted.

Which of the following is TRUE?

(A) I only (B) II only
(C) I and II (D) None of these

35. Consider the following schema.
Student (Roll-No, Name, Gender, Age, Marks, Address)
Among the given attributes Roll No, Name, Age are uniquely identified. Which of the following is NOT a super key?

(A) {Roll No, Name, Age, Gender, Marks}
(B) {Age, Gender, Marks, Address}
(C) {Gender, Marks, Address}
(D) {Gender, Marks, Address, Name}

36. If the system of linear equations
$2x_1 + 3x_2 + 5x_3 + 7x_4 = 0$
$-2x_2 + ax_3 = 0$
$3x_3 + 2x_4 = 0$
$6x_2 + bx_4 = 0$
has a non-trivial solution, then 'a' and 'b' are related by _____.

(A) $a + 2b = 0$ (B) $a - 2b = 0$
(C) $2a + b = 0$ (D) $2a - b = 0$

37. The coefficient of x^3 in the Maclaurin's series expansion of $(1 - x)^{5/2}$ is _____.

38. A fair die is rolled twice. Let X denote the number on the die in the first roll and let Y denote the number on the die in the second roll. Then the value of:
$P(X + Y = 6/X - Y = 2)$
is _____.

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$
(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

39. Consider a relation $R = \{(x, y)/x, y \in Z^+$ and 'xy' is a perfect square$\}$ over the set of positive integers. Which of the following statements is/are TRUE about the relation R?

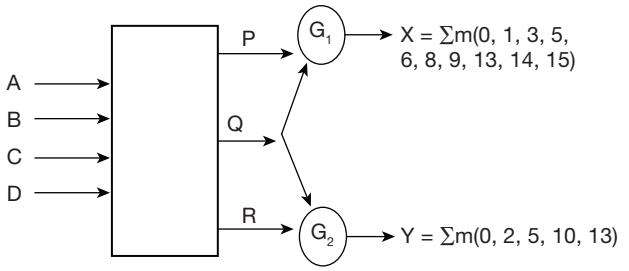
I. R is an equivalence relation.
II. R is a partial ordered relation.

(A) I only (B) II only
(C) Both I and II (D) Neither I nor II

40. The dual of the statement formula "$p \to (\neg q \to r)$" is _____.

(A) $\neg p \to (q \to r)$ (B) $p \to (q \to \neg r)$
(C) $\wedge p \neg q \wedge r$ (D) $p \wedge q \wedge r$

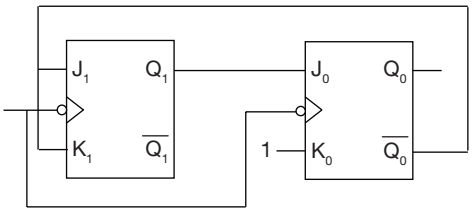
41. Given Combinational network with four inputs A, B, C, D and three intermediate outputs P, Q, R and two outputs X and Y as shown in figure.



Assuming that G_1 is NAND gate, and G_2 is AND gate, find the smallest function 'Q'. (with minimum number of min terms) which makes it possible to produce X and Y?

(A) $\bar{A}\bar{C}D + A\bar{C}\bar{D} + \bar{A}B + B\bar{C}\bar{D}$
(B) $\bar{A}\bar{B} + \bar{A}C\bar{D} + \bar{A}C\bar{D} + \bar{B}C\bar{D}$
(C) $\bar{A}\bar{B} + \bar{A}C + B\bar{C}$
(D) $\bar{A}\bar{B}\bar{D} + \bar{A}BD + A\bar{B}C + B\bar{C}$

42. Consider the following synchronous counter with JK flip flops, with initial state at reset.



If the JK flip flops have to be replaced by D flip flops, for the same sequence then the D flip flop inputs D_1, D_0 are (corresponding to Q_1, Q_0 flip flops)

(A) $D_1 = Q_1 \oplus Q_0, D_0 = Q_1 \bar{Q}_0$

(B) $D_1 = Q_1 \odot Q_0, D_0 = Q_1 \bar{Q}_0$

(C) $D_1 = Q_1 + Q_0, D_0 = Q_1 \oplus Q_0$

(D) $D_1 = Q_1 \odot Q_0, D_0 = Q_1 + \bar{Q}_0$

43. Consider a word addressed memory hierarchy system with the following parameters:
Block size = 16 words
Main memory size = 64 blocks
Cache size = 8 blocks
The cache uses direct mapped technique. The tag values in the cache directory are:

Cache line number	Tag
0	000
1	101
2	100
3	010
4	101
5	010
6	100
7	001

Then which of the following main memory addresses will be a hit in cache?

(i) $(37A)_{16}$ (ii) $(22C)_{16}$
(iii) $(00C)_{16}$ (iv) $(1B9)_{16}$

(A) (i), (ii), (iii), (iv) (B) (ii), (iv)
(C) (i), (iii) (D) (ii), (iii)

44. Consider the following bit pattern:
1010 1101 0001 0000 0000 0000 0000 0000
Which of the following statements is/are correct?

(i) If the given bit pattern represents a 2's complement integer then its decimal equivalent is $(-1391460352)_{10}$.
(ii) If the given bit pattern represents an unsigned integer then its decimal equivalent is $(2804507955)_{10}$.
(iii) If the given bit pattern represents an IEEE 754 single precision floating point number then its decimal equivalent is $(-8.185 * 10^{-12})$

(A) (i) only (B) (i) and (iii)
(C) (ii) and (iii) (D) (i), (ii), (iii)

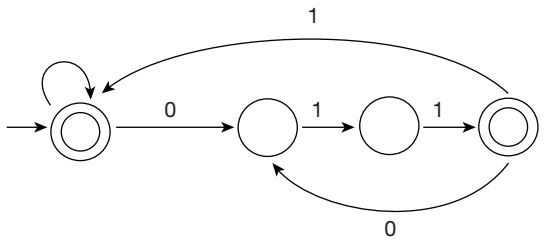
45. Which of the following statement is TRUE?

I. Assuming the same cache size and same block size, increasing set associativity of a cache reduces conflict misses.
II. Assuming the same set associativity and the same block size, increasing the size of a cache reduces compulsory misses.
III. Smaller caches have shorter hit time than larger caches.
IV. Increasing set associativity increases hit time.

(A) I, II, III (B) II, III, IV
(C) I, III, IV (D) I, II, IV

46. Construct a minimized DFA, M which accepts the binary strings w such that when you reverse w you get a binary integer that is divisible by 5.
If M has x states and y self-loops then the product of $x * y$ is _____.

47. Consider the following languages:
L_1 is the language described by 1* (0111*)*.
L_2 is the language of strings with atleast one 0 and atleast two 1's.
L_3 is the language of below finite automata:



L_4 is the language described by (0 + 1)* 01 (0 + 1)* 1.
Which of the following is TRUE?
(i) $L_1 = L_3$ (ii) $L_1 \subset L_4$ (iii) $L_4 \subset L_2$
(A) (i) only (B) (i), (iii) only
(C) (ii), (iii) only (D) (i), (ii), (iii)

48. Which of the following language is Decidable?

I. Checking whether a given natural number is prime or not.
II. $\{<M> | M \text{ is a DFA and } L(M) = \Sigma^*\}$
III. Post correspondence problem (PCP).

(A) (I), (II) (B) (II), (III)
(C) (I), (III) (D) (I), (II), (III)

49. Consider sending a 2500 Byte datagram into a link which has a maximum transmission unit (MTU) of 700 Bytes. The datagram has an identification number 422. The number of fragments generated and their respective fragmentation offset values will be:
(A) 4; 0, 680, 1360, 2040
(B) 5; 0, 700, 1400, 2100, 2800
(C) 4; 0, 85, 170, 255
(D) 5; 0, 85, 170, 255, 340

50. Four equal-sized datagrams belonging to the same message leave for the destination one after another. These datagrams travel through different paths as given below:

Datagram	Path length	Visited switches
1	3000 km	1, 3, 5
2	10,800 km	1, 2, 5
3	13,000 km	1, 2, 3, 5
4	10,000 km	1, 4, 5

Assume that the delay for each switch is 2, 9, 23, 7 and 18 ms respectively. If the propagation speed is $2*10^8$ m, then the delays of the datagrams 1, 2, 3, 4, respectively is:
(A) 15 m sec, 54 m sec, 65 m sec, 50 m sec.
(B) 58 m sec, 83 m sec, 116 m sec, 77 m sec.

(C) 15 m sec, 83 m sec, 65 m sec, 77 m sec.
(D) 58 m sec, 54 m sec, 116 m sec, 50 m sec.

51. A multicast address for a group is 232.48.60.9. What is its equivalent 48-bit Ethernet address for a LAN using TCP/IP?
(A) 01:00:5E:7F:30:C0
(B) 01:1B:C2:43:03:C0
(C) 33:33:5E:30:3C:09
(D) 01:00:5E:30:3C:09

52. Quick sort algorithm is run on two inputs shown below to sort in ascending order:
(i) A sequence of 'n' even numbers, 2, 4, 6, 8… n.
(ii) A sequence of 'n' odd numbers, 1, 3, 5, 7…n.
Let A_1 and A_2 be the number of comparisons made for the inputs (i) and (ii) respectively, then:
(A) $A_1 > A_2$
(B) $A_1 < A_2$
(C) $A_1 = A_2$
(D) Cannot be determined

53. A binary search tree is used to locate the number 86. Few probe sequences are given below:
I. 102, 78, 98, 87, 90, 88, 86
II. 200, 190, 198, 76, 84, 77, 85, 86
III. 140, 139, 110, 120, 109, 86
IV. 100, 96, 92, 90, 83, 84, 86
Which of the following probe sequence(s) is/are possible to locate '86'?
(A) I and II (B) I and III
(C) III and IV (D) IV only

54. Given the alphabets A, B, C, D, E, F, G and H with the probabilities $\frac{2}{40}, \frac{2}{40}, \frac{3}{40}, \frac{4}{40}, \frac{6}{40}, \frac{6}{40}, \frac{13}{40}$ respectively.
The average Huffman code size in bits per symbol is _____.
(A) $\frac{99}{40}$ (B) $\frac{101}{40}$
(C) $\frac{111}{40}$ (D) $\frac{121}{40}$

55. The following relation schema can be used to register information on the repayments on loans.
Repayment (Borrower-Id, name, address, loan-amount, request-date)
A borrower is identified with a unique borrower-id, and has only one address and name. Borrowers can have multiple simultaneous loans, but they always have different request-dates.
What is the key for Repayment?
(A) Borrower-Id
(B) Borrower-Id, request-date
(C) Borrower-Id, loan-amount
(D) request-date, loan-amount

56. Consider the SQL query given below:
DELETE
FROM Loan A
WHERE loan-amount = (SELECT SUM (repayment - amount))
FROM Loan-Payment B
WHERE B.Customer-Id = A.Customer-Id AND B.request-date = A.request-date
The above query
(A) Deletes all information of customers who have requested loan amount on same day.
(B) Deletes all information on ended loans, where the total repaid amount equals the lend amount.
(C) Deletes all information of customers whose have requested the same amount.
(D) None of the above

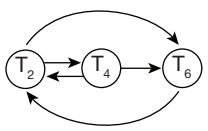
57. Match the following:

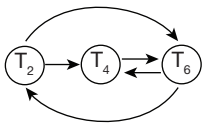
Set–1	Set–2
(P) Belady's anomaly	(a) Round Robin scheduling
(Q) Banker's algorithm	(b) Deadlock avoidance
(R) Time sharing system	(c) Deadlock prevention
(S) Simple Paging	(d) FIFO page replacement policy
	(e) Internal fragmentation
	(f) External fragmentation
	(g) Priority scheduling

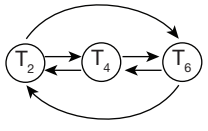
(A) P – g, Q – c, R – g, S – f
(B) P – d, Q – b, R – a, S – e
(C) P – d, Q – b, R – g, S – f
(D) P – d, Q – c, R – a, S – e

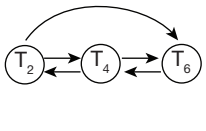
58. Consider the following transaction schedule:

T_2	T_4	T_6
	R(Q)	
W(Q)		
		W(Q)
	R(Q)	
W(Q)		
	W(Q)	

Which of the following is the precedence graph for the above schedule?
(A) 

(B) 

(C) 

(D) 

59. Consider the following code:

```
procedure main
    procedure A
        procedure B
            procedure C
                :
                end
        end
    end

    procedure D
        :
        end
end
```

The nesting depth of procedures A, B, C, D is:

(A) 1, 2, 3, 4 (B) 1, 2, 3, 1
(C) 2, 3, 4, 2 (D) 2, 3, 4, 5

60. Consider the grammar:
$G_1 : X \rightarrow Xy \mid x$
$G_2 : X \rightarrow YXy \mid x$
$Y \rightarrow \in$
Which of the following is True?
(A) Only G_1 is LR (1)
(B) Only G_2 is LR (1)
(C) Both G_1 and G_2 are LR (1)
(D) None of the above

61. Consider an AVL tree with root node as "a". Inorder predecessor of root as b, Inorder successor of root as c, the left child of root as d and the right child of root as e. Then which of the following relation is TRUE.

(A) $d < b < a < c < e$ (B) $a < b < c < d < e$
(C) $b < d < a < e < c$ (D) $e < c < a < b < d$

62. Consider the routine fun():
void fun(int x)
{if ($x >= 2$){fun (x/2); fun (x/2); printf ("#");}}
Number of times the printf() executed when fun(16) is called is _____.

63. Consider the following process table:

	Arrival time	Burst time
P_1	1	4
P_2	2	8
P_3	3	5
P_4	4	6

If Round Robin scheduling (with time slice = 2 units) is used to schedule above processes, then the number of context switches (don't consider start and end context switches) is _____.

64. Consider the postfix expression:
$a\ b + c\ *\ d\ e\ f\ g\ \wedge\ \wedge\ -\ /$
consider the following statements:
$S1$: +, − has high precedence over ^ .
$S2$: ^ has high precedence over *, / and ^ associates from left to right.
$S3$: / has high precedence over *
Which of the above statements are TRUE?
(A) $S1$, $S2$ (B) $S1$, $S3$
(C) only $S3$ (D) None of the above

65. Consider a system with 1 GB physical memory and 64-bit virtual address space if the page size is 1 MB then the size of the page table is (size in Tb) _____.

Answer Keys

1. B	**2.** 2	**3.** D	**4.** A	**5.** A	**6.** C	**7.** D	**8.** C	**9.** B	**10.** A
11. 6	**12.** A	**13.** A	**14.** B	**15.** 1820	**16.** D	**17.** C	**18.** 1	**19.** 32	**20.** B
21. 42	**22.** 2047	**23.** 2048	**24.** 2048	**25.** B	**26.** B	**27.** 3	**28.** C	**29.** A	**30.** D
31. B	**32.** C	**33.** A	**34.** A	**35.** C	**36.** D	**37.** –0.32 to – 0.31		**38.** B	**39.** A
40. C	**41.** D	**42.** B	**43.** D	**44.** B	**45.** C	**46.** 10	**47.** B	**48.** A	**49.** C
50. B	**51.** D	**52.** C	**53.** D	**54.** C	**55.** B	**56.** B	**57.** B	**58.** C	**59.** C
60. A	**61.** A	**62.** 15	**63.** 11	**64.** D	**65.** 160				

Hints and Explanations

1. The given statement is a hypothetical one. An unreal situation is presented here so the verb "were" is apt. Choice (B)

2. Let t hours be the time taken to cross each other.
Then, distance covered by Ram, to meet the other $= xt$ km $\rightarrow$ (1)
The distance covered by Shyam, to meet the other $= yt$ km $\rightarrow$ (2)
But, as per data, (1) is y times (2).
Hence, $xt = (y)\ (yt)$;
$\Rightarrow x = y^2$.
It is given that $x = 4$; hence $y = 2$. Ans: 2

3. Khadar's wife's daughter is Khadar's daughter whose mother is Khadar's wife. Khadar's wife's daughter-in-law is Khadar's daughter-in-law. Her husband's father is Khadar himself. Choice (D)

4. Except (A) all the other combinations have a synonymous relationship. "Empirical" is that which can be practically proved while "emaciated" is lean and weak. Momentous means significant. In (A) both the words are antonyms. Beatific means sublime while mundane is common or coarse. Choice (A)

5. The ratio of sales of Kissan to Sil is the highest in the year 2012 and this highest ratio equals 2.19.

Choice (A)

6. The right idiom to fit the bill is "stood their ground", which means to stick to one's stand on one's decision. To "pass the buck" is to shrug off responsibility, "broaden one's horizons" is to enlarge one's range of activities and world and "to hear something on the grapevine" is to get to know something via rumours. To "promise somebody the moon" is to promise somebody something that is impossible to deliver. Choice (C)

7. Statement (i) is about disposal techniques which is not the point of discussion or the source of the problem. Similarly (iii) is not the point of discussion which actually finds a solution to the problem. The possible solutions are offered in (ii) and (iv). It is necessary to create awareness among public and staff to incorporate safe injection practices and make extensive use of AD syringes. Choice (D)

8. Let $x = \sqrt{5 + \sqrt{5 - \sqrt{5 + \sqrt{5} \ldots}}}$

We can see that $x > \sqrt{5} (\sqrt{5} \approx 2.25)$

Choice (1): $\frac{\sqrt{13} - 1}{2} \approx \frac{3.6 - 1}{2} \approx 1.3$

Choice (2): $\frac{\sqrt{17} - 1}{7} \approx \frac{4.2 - 1}{2} \approx 1.6$

$\therefore (x^2 - 5)^2 = 5 - x$ (1)

Now consider $x = \frac{\sqrt{17} + 1}{2}$ (2)

$\therefore \quad 5 - x = \frac{9 - \sqrt{17}}{2}$

$(2) \Rightarrow x^2 = \frac{18 + 2\sqrt{17}}{4} = \frac{9 + \sqrt{17}}{2}$

$\therefore \quad x^2 - 5 = \frac{\sqrt{17} - 1}{2}$

$\therefore \quad (x^2 - 5)^2 = \frac{18 - 2\sqrt{17}}{4} = \frac{9 - \sqrt{17}}{2}$

$\therefore \quad x = \frac{\sqrt{17} + 1}{2}$ satisfies (1) Choice (C)

9. The sentence which is logically valid and can be inferred from the given sentence is:
America would not have entered the world war if Japan would not have attacked the Pearl Harbour.
Japan's attack on pearl Harbour is cited as the reason for the America entering. Choice (B)

10. Statement (A) is grammatically correct and clearly brings out the intended meaning that a tip today would be enough to buy a meal three years ago. Choice (B) is ungrammatical as "today's" does not use an apostrophe. In (C) "three-years-ago meal" distorts the meaning. (D) uses "would costed" which is ungrammatical.
Choice (A)

11. In the abelian group (G, x_7) with $G = \{1, 2, 3, 4, 5, 6\}$
1 is the identity element.
$\therefore$ If 'a' is the element in G which is the inverse of itself, then $ax_7a = 1$.
$\Rightarrow$ The remainder when $a \times a$ is divided by 7 should be 1
$\Rightarrow$ $(a \times a) - 1$ should be a multiple of 7
$\Rightarrow$ $a^2 - 1 = 7k$ for some possitive integer k
And among the elements in G, the only element that satisfies this condition is 6.
$\therefore \quad a = 6$
$\therefore \quad 6 \in G$ is the inverse of itself. Ans: 6

12. We have $\int_0^{\pi} \sin^8 x\, dx = 2\int_0^{\frac{\pi}{2}} \sin^8 x\, dx$

$$\left(\because \int_0^{2a} f(x)dx = 2\int_0^{a} f(x)\, dx; \text{ if } f(2a - x) = f(a) \right)$$

$$= 2\left[\frac{8-1}{8} \cdot \frac{8-3}{8-2} \cdot \frac{8-5}{8-4} \cdot \frac{1}{2} \cdot \frac{\pi}{2}\right]$$

$$\left(\because \int_0^{\frac{\pi}{2}} \sin^n x dx = \frac{n-1}{n} \cdot \frac{n-3}{n-2} \cdot \frac{n-5}{n-4} \ldots \frac{3}{4} \cdot \frac{1}{2} \cdot \frac{\pi}{2} \text{ if } n \text{ is even} \right)$$

$$= 2\left[\frac{7}{8} : \frac{5}{6} \cdot \frac{3}{4} \cdot \frac{1}{2} \cdot \frac{\pi}{2}\right]$$

$$= \frac{7^2}{8.7} \cdot \frac{5^2}{6.5} \cdot \frac{3^2}{4.3} \cdot \frac{1^2}{2.1}\pi = \frac{7^2 \cdot 5^2 \cdot 3^2 \cdot 1^2}{8!}\pi.$$ Choice (A)

13. Given $A = \begin{bmatrix} 3 & 1 & 2 \\ 6 & 4 & 5 \\ 9 & 7 & 11 \end{bmatrix}$

As the principal diagonal elements of L are equal to 1 in the LU decomposition of A, we have
$A = LU$ (1)
where $L = \begin{bmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{bmatrix}$ and

$$U = \begin{bmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{bmatrix}$$

$\therefore$ From (1)

$$\begin{bmatrix}3&1&2\\6&4&5\\9&7&11\end{bmatrix}=\begin{bmatrix}1&0&0\\l_{21}&1&0\\l_{31}&l_{32}&1\end{bmatrix}\begin{bmatrix}u_{12}&u_{12}&u_{13}\\0&u_{22}&u_{23}\\0&0&u_{33}\end{bmatrix}$$

$$\begin{bmatrix}3&1&2\\6&4&5\\9&7&11\end{bmatrix}$$

$$=\begin{bmatrix}u_{11}&u_{12}&u_{13}\\l_{21}u_{11}&l_{21}u_{12}+u_{22}&l_{21}u_{13}+u_{23}\\l_{31}u_{11}&l_{31}u_{12}+l_{32}u_{22}&l_{31}u_{13}+l_{32}u_{23}+u_{33}\end{bmatrix}$$

Comparing the corresponding elements on both sides We have

$u_{11} = 3$; $u_{12} = 1$ and $u_{13} = 2$

$l_{21}u_{11} = 6$

$\Rightarrow \quad l_{21} = \frac{6}{3} = 2$

$l_{21}u_{12} + u_{22} = 4$

$\Rightarrow \quad u_{22} = 4 - 2 \times 1 = 2$

$l_{31}u_{11} = 9$

$\Rightarrow \quad l_{31} = \frac{9}{3} = 3$

$l_{31}u_{12} + l_{32}u_{22} = 7$

$\Rightarrow \quad 3 \times 1 + l_{32} \times 2 = 7$

$\Rightarrow \quad l_{32} = \frac{7-3}{2} = 2$

$\therefore \quad L = \begin{bmatrix}1&0&0\\l_{21}&1&0\\l_{31}&l_{32}&1\end{bmatrix} = \begin{bmatrix}1&0&0\\2&1&0\\3&2&1\end{bmatrix}$. Choice (A)

14. A matching of a graph G is a set of edges in G such that no two edges of that set are incident on the same vertex. A perfect matching (Also known as a complete matching) of a graph G is a matching in which every vertex of G is incident on exactly one of the edges of the set of edges in perfect matching.

Among the sets of edges given in options, the set given in option (B), viz $\{d, e, f, j\}$ is NOT a perfect matching because both the edges e and d are incident on the same vertex V_3 and also, the vertex V_6 is incident on none of the edges given in the set. Choice (B)

15. We know that the number of non-negative integral solutions of $x_1 + x_2 + x_3 + ... + x_n \le r$.

= The number of non negative integral solutions of $x_1 + x_2 + x_3 + ... + x_n + x_{n+1} = r$.

$\therefore$ The number of non negative integral solutions of $x_1 + x_2 + x_3 + x_4 < 13$

The number of non-negative integral solutions of $x_1 + x_2 + x_3 + x_4 \le 12$

= The number of non-negative integral solutions of the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 12$ is

$= C(5 - 1 + 12, 12)$

($\because$ The number of non-negative integral solutions of $x_1 + x_2 + ... + x_k = s$ is $C(k - 1 + s, s)$)

$= C(16, 12)$

$= {}^{16}C_{12} = 1{,}820$ Ans: 1,820

18. Need matrix:

Process	need
P_1	2
P_2	1
P_3	6
P_4	5
P_5	5

Resources required to be available is 1. Ans : 1

19. Counting semaphore value = 25

33 down operations results semaphore value to be 25-33 = −8. and 40 UP operations results semaphore value to be –8 + 40 = 32 Ans : 32

20. Choice (B)

21. No. of possible permutations that can be obtained with 'n' numbers with 1, 2, 3, ... n (in that order) using stack is

$$\frac{2^n C_n}{n+1} = \frac{{}^{10}C_5}{5+1} = 42 = 42$$ Ans: 42

22. The maximum number of elements in a heap of height h is $2^{h+1} - 1$

Here $h = 10$,

So number of elements $= 2^{10+1} - 1$

$= 2048 - 1 = 2047$ Ans: 2047

23. PC uses 8-bits to access BHT.

$\Rightarrow$ There will be 2^8 entries. Each entry requires 8-bits for storing history. (for 8 branches)

$\therefore$ Total bits required for BHT $= 8 \times 2^8 = 2048$ bits.

Ans: 2048

24. Cache is 4-way set-associative. i.e., each set has 4 blocks.

Given byte offset is 4-bits, so block size = 2^4 bytes.

5-bits required for set index, so the number of sets in cache = 2^5

$\therefore$ Data portion in cache = number of sets × lines in set × line size

$= 2^5 \times 4 \times 2^4 = 2048$ Bytes Ans: 2048

25. Given regular expression accepts the strings in which every 0 that is not last symbol is immediately followed by a 1 and every 1 that is not last symbol is immediately followed by a 0.

The strings accepted are

{ε, 1, 0, 01, 10, 0101, ...} Choice (B)

26. Regular and Recursive languages are closed under union, intersection and complementation CFL is not closed under intersection, complement.

Recursively enumerable languages are not closed under complementation. Choice (B)

27. Given 8 stations,

	Bit time				
	0	1	2	3	4
1 0 1 0 1	1	0	-	-	-
0 1 1 0 0	0	-	-	-	-
1 1 1 0 1	1	1	1	0	1
0 0 0 1 0	0	-	-	-	-
0 0 1 0 1	0	0	-	-	-
0 1 0 1 0	0	-	-	-	-
1 1 1 0 0	1	1	1	0	0
1 0 0 1 1	1	0	-	-	-
Result	1	1	1	0	1

3^{rd} station will transmit data first. (Higher numbered station has higher priority). Ans: 3

28. Given p = 7, $q = 11$

$\Rightarrow \quad z = (p-1) * (q-1) = 6 * 10 = 60$

Based on RSA,

$(e * d) \bmod z = 1$

if $e = 108 \quad \Rightarrow (108 * 7)\% \ 60 \neq 1$

if $e = 170 \quad \Rightarrow (170 * 7)\% \ 60 \neq 1$

if $e = 43 \quad \Rightarrow (43 * 7)\% \ 60 = 1$

$\therefore$ valid e value is 43. Choice (C)

29. Radix sort:

It will sort the keys, based on the digits in a key.

Choice (A)

30. Both the given statements are TRUE about Weak Entity.

Choice (D)

31. Assume a very large value for 'n', then the sequence will be $\log(\log n) \le \log(\log n^2) \le \log(\log_2 n!) \le \log_2(n!)$

Choice (B)

32. π-eliminates duplicates from the result, Cartesian product is represented with (,) operator in SQL. Choice (C)

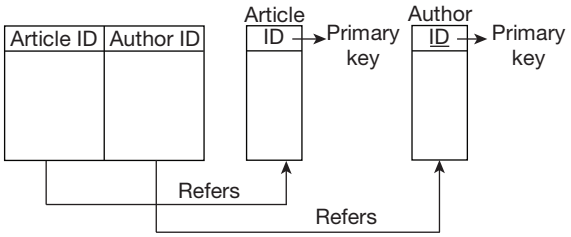
33. Given circuit is a ripple counter, $\bar{Q}_0$ is connected to rising edge Clk pulse, so it is UP counter.

Clk	Q_1	Q_0
0	0	0
1	0	1
2	1	0
3	1	1
4	0	0

Choice (A)

34. Table:

Authoring



—table that does not affect other tables, because the Authoring table is not referred by any table.

—If any deletion is performed in tables, Article and Author, that will affect the contents of Authoring table, because Authoring table refers to both the tables Author and Article.

I. TRUE II. FALSE Choice (A)

35. The uniquely identified attributes are candidate keys, among available candidate keys one attribute can be chosen as primary key. Super key must contain atleast one candidate key along with other attributes option (C) has no candidate key. Choice (C)

36. Given system of linear equations is:

$$\left.\begin{aligned} 2x_1 + 3x_2 + 5x_3 + 7x_4 &= 0 \\ -2x_2 + ax_3 &= 0 \\ 3x_3 + 2x_4 &= 0 \\ 6x_2 + bx_4 &= 0 \end{aligned}\right\} \quad (1)$$

(1) can be written in matrix form as $AX = O$

Where $A = \begin{bmatrix} 2 & 3 & 5 & 7 \\ 0 & -2 & a & 0 \\ 0 & 0 & 3 & 2 \\ 0 & 6 & 0 & b \end{bmatrix}$; $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$ and $O = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$

Given that (1) has a non-trivial solution

$\Rightarrow$ Det $(A) = 0$

$$\Rightarrow \begin{vmatrix} 2 & 3 & 5 & 7 \\ 0 & -2 & a & 0 \\ 0 & 0 & 3 & 2 \\ 0 & 6 & 0 & b \end{vmatrix} = 0$$

$$\Rightarrow \quad 2\begin{vmatrix} -2 & a & 0 \\ 0 & 3 & 2 \\ 6 & 0 & b \end{vmatrix} = 0$$

$$\Rightarrow \quad 2\left(-2\begin{vmatrix} 3 & 2 \\ 0 & b \end{vmatrix} + 6\begin{vmatrix} a & 0 \\ 3 & 2 \end{vmatrix}\right) = 0$$

$\Rightarrow \quad 2(-6b + 12a) = 0$

$\Rightarrow \quad 2a - b = 0.$ Choice (D)

37. Let $f(x) = (1-x)^{5/2}$

The coefficient of x^3 in the Maclaurin's series expansion of $f(x) = \dfrac{f'''(0)}{3!}$

$$f(x) = (1-x)^{5/2} \quad \Rightarrow \quad f'(x) = \frac{-5}{2}(1-x)^{3/2}$$

$$\Rightarrow \quad f''(x) = \frac{5}{2} \times \frac{3}{2}(1-x)^{1/2} \text{ and}$$

$$f'''(x) = \frac{-5}{2} \times \frac{3}{2} \times \frac{1}{2}(1-x)^{-\frac{1}{2}}$$

$$\therefore f'''(0) = \frac{-15}{8}$$

The coefficient of x^3 in the Maclaurin's series expansion of $(1-x)^{5/2} = \dfrac{\left(\frac{-15}{8}\right)}{3!} = \dfrac{-5}{16} = -0.3125$

Ans: –0.32 to –0.31

38. Given that X and Y denote the numbers shown up on the die in the first roll and the second roll respectively

$\therefore \quad P(X+Y=6/X-Y=2)$

$$= \frac{P[(X+Y=6)\cap(X-Y=2)]}{P(X-Y=2)}$$

$$= \frac{P(X=4,Y=2)}{P\left[\begin{array}{l}(X=3,Y=1)\cup(X=4,Y=2)\cup\\ (X=5,Y=3)\cup(X=6,Y=4)\end{array}\right]}$$

$$= \frac{P(X=4,Y=2)}{\begin{array}{l}P(X=3,Y=1)+P(X=4,Y=2)\\ +P(X=5,Y=3)+P(X=6,Y=4)\end{array}}$$

$$= \frac{P(X=4)\,P(Y=2)}{\begin{array}{l}P(X=3)\,P(Y=1)+P(X=4)\,P(Y=2)\\ +P(X=5)\,P(Y=3)+P(X=6)P(Y=4)\end{array}}$$

(QX and Y are independent random variables)

$$= \frac{\frac{1}{6}\times\frac{1}{6}}{\frac{1}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}+\frac{1}{6}\times\frac{1}{6}} = \frac{1}{4}.$$ Choice (B)

39. Given relation is $R = \{(x, y)/x, y \in Z^+$ and 'xy' is a perfect square$\}$

For any $a \in Z^+$, $a.\ a = a^2$ is a perfect square

$\therefore \quad (a, a) \in R, \forall\ a \in Z^+$

$\therefore \quad R$ is reflexive (1)

Consider $(a, b) \in R$

$\Rightarrow$ $a\ b$ is a perfect square

$\Rightarrow$ $b\ a$ is also a perfect square

$\Rightarrow$ $(b, a) \in R$

$\therefore \quad R$ is symmetric (2)

Let $(a, b) \in R$ and $(b, c) \in R$

$\Rightarrow$ $a\ b$ is a perfect square and $b\ c$ is a perfect square

Let a $b = k^2$ for some $k \in Z^+$ and $bc = l^2$ for some $l \in Z^+$

$$ab = k^2 \Rightarrow a = \frac{k^2}{b} \text{ and } bc = l^2 \Rightarrow c = \frac{l^2}{b}$$

$$\text{Consider } ac = \left(\frac{k^2}{b}\right)\left(\frac{l^2}{b}\right)$$

$$= \frac{k^2l^2}{b^2}$$

$$\therefore \quad ac = \left(\frac{kl}{b}\right)^2$$

$\Rightarrow$ ac is also a perfect square

$\Rightarrow$ $(a, c) \in R$

$\therefore \quad R$ is transitive (3)

Hence from (1), (2) and (3), R is an equivalence relation

$\therefore$ (I) is TRUE

Consider $(2, 18) \in R$

Clearly, $(18, 2) \in R$

But $2 \neq 18$

$\therefore \quad R$ is NOT anti-symmetric

Hence R is NOT a partial ordered relation

$\therefore$ (II) is NOT TRUE

$\therefore$ Only (I) is TRUE. Choice (A)

40. Let $F(p, q, r) \Leftrightarrow p \rightarrow (\neg q \rightarrow r)$ (1)

$\Leftrightarrow \neg p\ v\ (\neg(\neg q) \vee r)$

$(\because A \rightarrow B \Leftrightarrow \neg A \vee B)$

$\Leftrightarrow \neg p \vee q \vee r\ (\because \neg(\neg A) \Leftrightarrow A)$

The dual of $F(p, q, r)$ is $\neg p \wedge q \wedge r$. Choice (C)

41. $X = \overline{P \cdot Q}$ ($\because$ G_1 is NAND gate)

$= \oplus m$ (0, 1, 3, 5, 6, 8, 9, 13, 14, 15)

$P.Q = \oplus m$ (2, 4, 7, 10, 11, 12)

$Y = Q \cdot R = \oplus m$ (0, 2, 5, 10, 13) ($\because$ G_2 is AND gate)

From above two equations, $Q = \oplus m$ (0, 2, 4, 5, 7, 10, 11, 12, 13)

AB \ CD	00	01	11	10
00	1			1
01	1	1	1	
11	1	1		
10			1	1

$\therefore \quad Q = \bar{A}\bar{B}\bar{D} + \bar{A}BD + A\bar{B}C + B\bar{C}$ Choice (D)

42. Here $J_1 = K_1 = \bar{Q}_0,\ J_0 = Q_1, K_0 = 1$

If JK flipflop has to be replaced with D flip flop then

$D = J\,K$ characteristic equation $= J\bar{Q} + \bar{K}Q$

So, $D_1 = J_1\bar{Q}_1 + \bar{K}_1Q_1$

But here $J_1 = \bar{Q}_0, K_1 = \bar{Q}_0$ (as per connections given)

$D_1 = \bar{Q}_0 \cdot \bar{Q}_1 + \bar{\bar{Q}}_0Q_1 = \bar{Q}_0\bar{Q}_1 + Q_0Q_1 = Q_0 \odot Q_1$

Similarly $D_0 = J_0\bar{Q}_0 + \bar{K}_0Q_0$

$J_0 = Q_1, K_0 = 1$

So $D_0 = Q_1 \cdot \bar{Q}_0 + 0 \cdot Q_0$

$D_0 = Q_1\bar{Q}_0$

(or) Find the sequence of given counter, and design the same sequence counter with D-flip flops. Choice (B)

43. Given, Block size = 16 words

Main memory size = 64 Blocks

Cache size = 8 Blocks

Main memory size = 64 × 16 words = 2^{10} words

In direct mapped system,

Tag	Line	Word

10-bits

10-bits

Word field size = 4

Line field size = 3 ($\because$ 8 blocks in cache)

$\Rightarrow$ Tag = 3 bits

(i) 37A: 0011 0 | 111|1010

Line 7 but Tag mis-match

$\Rightarrow$ (i) is a miss

(ii) 22C:0010 0 | 010 | 1100

Line 2 and Tag matched

$\Rightarrow$ (ii) is a Hit

(iii) 00C:0000 0 | 000 | 1100

Line 0 and Tag matched

$\Rightarrow$ (iii) is a Hit.

(iv) $(1B9)_{16}$: 0001 1 | 011 | 1001

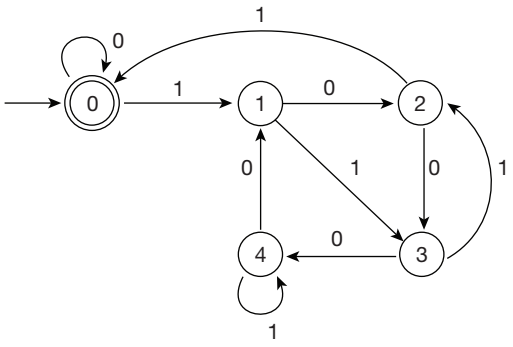
Line 3 but tag mis-match

$\Rightarrow$ (iv) is a miss. Choice (D)

44. (i) assumes, given bit pattern represents a 2's complement integer.
For a 2's complement number, if the MSB is 1, take 2's complement to the magnitude to get correct binary number and then convert to decimal.
1|010 1101 0001 0000 0000 0000 0000 0000
⇓ 1's complement
101 0010 1110 1111 1111 1111 1111 1111
⇓ 2's complement
101 0010 1111 0000 0000 0000 0000 0000
⇓ Decimal
– 1391460352
∴ (i) is correct
(ii) assumes that given bit pattern represents an unsigned integer. To get its decimal equivalent all the bits in the given number are considered.
1010 1101 0001 0000 0000 0000 0000 0000
⇓ Decimal
2903506944
∴ (ii) is incorrect.
(iii) assumes that given bit pattern represents a single precision floating point number.
1 | 010 1101 0 | 001 0000 0000 0000 0000 0000
Sign = –
Exponent = Biased exponent –127
= 90 – 127 = –37
Mantissa = 1.001
∴ Given number is equivalent to $(-1.001) \times 2^{-37}$
$= -8.185 \times 10^{-12}$
∴ (iii) is correct Choice (B)

45. Conflict misses can be reduced by increasing set-associativity. Compulsory misses will not be reduced by increasing the size of cache without increasing block size. Smaller caches have shorter hit time than larger cache.
By increasing associativity of a cache the hit time also increases as the Tag bits need to be compared with all the blocks of the set. Choice (C)

46. The DFA which accepts the binary strings ω such that when you reverse ω, the resultant binary integer is divisible by 5 is shown below:



This accepts the strings,
{101, 0101, 1111, 00101, 10011, ...}
It has $x = 5$ states and $y = 2$ self loops.
∴ $x * y = 5 * 2 = 10$ Ans: 10

47. L_1 is described by 1* (0111*)*
L_3 is the finite automata for the language L_1.
L_1 is not subset of L_4. L_1 has all 1's which is not accepted by L_4.
L_4 has one zero and two 1's. L_2 has atleast one 0 and atleast two 1's. So $L_4 \subset L_2$. Choice (B)

48. PCP is an undecidable problem. Choice (A)

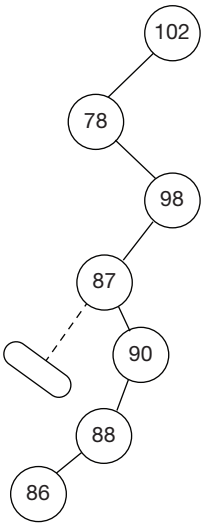
49. Size of data field in each fragment = 680 Bytes
(20 Bytes is for header)
Number of fragments required $= \left\lceil \frac{2500 - 20}{680} \right\rceil = 4$
Each fragment will have an identification number of 422.
The offsets of the 4 fragments will be 0, $\frac{680}{8}$
$= 85, \frac{1360}{8} = 170, \frac{2040}{8} = 255.$
(The fragmentation offset is a multiple of 8 Bytes).
Choice (C)

50. Delay for each datagram is (time taken to reach destination + delays at visited switches).
For Datagram 1,
arrival time $= \frac{3000 \text{ km}}{2 \times 10^8} = 15 \text{ m sec}$
Delay at switches 1, 3, 5 is
2 + 23 + 18 = 43 msec
∴ Delay for Datagram 1 is 15 + 43 = 58 msec
Delay for Datagram 2 is
$\frac{10,800 \times 10^3}{2 \times 10^8} + (2 + 9 + 18)$ msec
= 83 m sec
Delay for Datagram 3 is
$\frac{13000 \times 10^3}{2 \times 10^8} + (1 + 9 + 23 + 18)$
= 65 m sec + 51 m sec
= 116 m sec
Delay for Datagram 4 is
$\frac{10000 \times 10^3}{2 \times 10^8} + (2 + 7 + 18)$
= 50 m sec + 27 m sec = 77 m sec Choice (B)

51. Given IPv4 multicast address is 232.48.60.9.
Its binary equivalent is
1110 1000.00110000.00111100.00001001
First 4-bits represents, multicasting.
Remaining 28-bits gives the group ID.
48-bit Ethernet address for given multicast IPv4 address has the range
01:00:5*E*:00:00:00 – 01:00:5*E*:7*F*:*FF*:*FF*
In which last 23-bits are replaced with low 23-bits of the multicast IPv4 address.
Last 23-bits of given address are
011 0000.0011 1100.0000 1001
∴ Required 48-bit address is
01:00:5*E*:0011 0000:0011 1100:0000 1001
01:00:5*E*:30:3*C*:09 Choice (D)

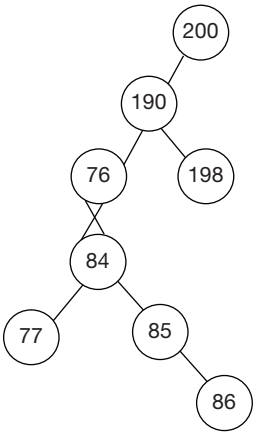
52. Quick Sort Algorithm gives worst case (maximum comparisons). Time Complexity is $(O(n^2))$ if the elements are already in ascending order.
Both (i) and (ii) are in ascending order.
$\therefore A_1 = A_2$ Choice (C)

53. I.



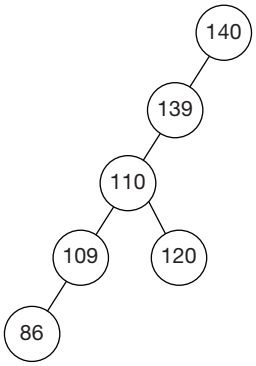
The search should have taken left path from element (87).

II.



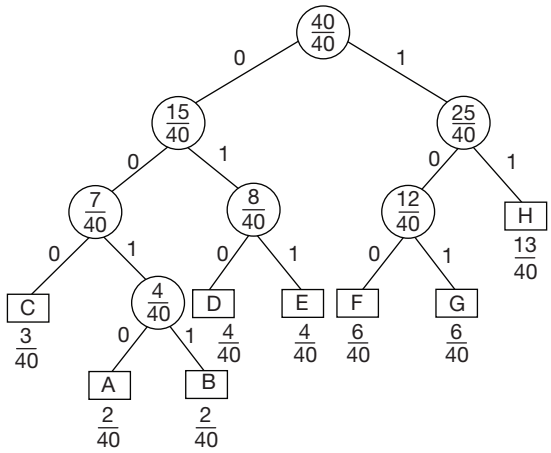
The search should be continuous (It should not change the paths).

III.



$\therefore$ Search is not continuous.
$\therefore$ Correct search Choice (D)

54. Huffman-coding:



Codes:
A = 0010 (4-bits)
B = 0011 (4-bits)
C = 000 (3-bits)
D = 010 (3-bits)
E = 011 (3-bits)
F = 100 (3-bits)
G = 101 (3-bits)
H = 11 (2-bits)
The average Huffman code size in bits per symbol is

$$\frac{2}{40}\times 4+\frac{2}{40}\times 4+\frac{3}{40}\times 3+\frac{4}{40}\times 3+\frac{4}{40}\times 3$$
$$+\frac{6}{40}\times 3+\frac{6}{40}\times 3+\frac{13}{40}\times 2$$
$$=\frac{8}{40}+\frac{8}{40}+\frac{9}{40}+\frac{12}{40}+\frac{12}{40}+\frac{18}{40}+\frac{18}{40}+\frac{26}{40}$$
$$=\frac{111}{40}$$

Choice (C)

55. From the data, The functional dependencies are
Borrower-id $\rightarrow$ name, address ($B \rightarrow NA$)
Borrower-id, request-date $\rightarrow$ loan-amount ($BR \rightarrow L$)
key:

L	M	R
BR		NAL

$BR^+ = \{\text{BRNAL}\}$
key = Borrower - Id, request - date Choice (B)

56. Lets assume some data.
Loan-payment B

Customer-Id	Repayment amount	Request date
C_1	1000	23/1/15
C_2	2000	28/2/15
C_3	4000	20/3/15
C_4	6000	19/1/15

C_1	2000	6/7/15
C_2	2000	8/8/15

Loan A

Customer-Id	Request date	Loan-amount
C_1	23/1/15	3000
C_2	28/2/15	4000
C_3	20/3/15	8000
C_4	19/1/15	7000

Sub query result:
Sum (repayment-amount)

C_1	3000
C_2	4000
C_3	4000
C_4	6000

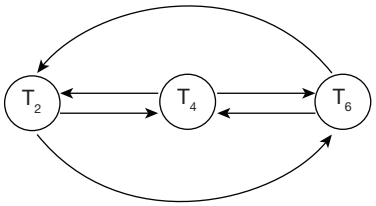
Loan amount = (select sum (repayment-amount))
C_1 3000 = C_1 3000
C_2 4000 = C_2 4000
C_3 8000 ≠ C_3 4000
C_4 7000 ≠ C_4 6000
For customers C_1, C_2 the repayment of loan is ended.
Choice (B)

57. Choice (B)

58.

	T_2	T_4	T_6
1		R(Q)	
2	W(Q)		
3			W(Q)
4		R(Q)	
5	W(Q)		
6		W(Q)	

Precedence graph:

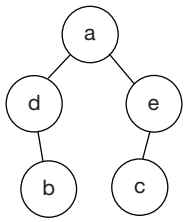


Conflicts
$T_4 \rightarrow T_2$ (1 to 2)
$T_2 \rightarrow T_6$ (2 to 3)
$T_4 \rightarrow T_6$ (1 to 3)
$T_6 \rightarrow T_4$ (3 to 4)
$T_2 \rightarrow T_4$ (2 to 4)
$T_6 \rightarrow T_2$ (3 to 5) Choice (C)

59. Nesting depth is calculated as follows
(1) The nesting depth of main program is 1.
(2) Add 1 to depth each time when a new procedure begins.
(3) Subtract 1 from depth each time when you exit from a nested procedure. Choice (C)

60. Choice (A)

61.



From this, $d < b < a < c < e$. Choice (A)

62. It prints 15 times Ans : 15

63.

P_1	P_2	P_3	P_1	P_4	P_2	P_3	P_4	P_2	P_3	P_4	P_2

Ready Queue: P_1, P_2, P_3, P_1, P_4, P_2, P_3, P_4, P_2, P_3, P_4, P_2, P_4 Ans: 11

64. The infix expression for the given postfix expression is $a + b * c/d - e \wedge f \wedge g$
^ has high precedence (associated from Right to left).
+ / has least precedence. Choice (D)

65. Page size is 1 MB so requires 20 bits.
$d = 20$
$p + d = 64$
$p = 64 - 20$
$p = 44$
page table size
$= 2^{44} \times 10$
$= 5 \times 2^{45}$
$= 160$ Tb
Ans : 160

$f + d = 30$
$f = 30 - 20$
$f = 10$