BYJU'S EXAM PREP

BEL

Computer Science & IT

Sample Mock Test - 1

Questions with detailed Solution

1. If tan x = Sin 45°, cos 45°+sin30°

Then the value of x is

A. 30° B. 45°

C. 60° D. 90°

Ans. B

Sol. tan x = Sin 45°, cos 45°+sin30°

$$= \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} + \frac{1}{2} = \frac{1}{2} + \frac{1}{2} = 1$$

$$\therefore \tan x = \tan 45^\circ \Rightarrow x = 45^\circ$$

2. From a point P, the angle of elevation of a tower is such that its tangent is 3/4. On walking 560 metres towards the tower the tangent of the angle of elevation of the tower becomes 4/3. What is the height (in metres) of the tower?

A. 720 B. 960

C. 840 D. 1030

Ans. B

Sol. Tangent of tower is 3/4

Let the perpendicular be 3x and the base be 4x.

Then hypotenuse will be 5x

On walking 560 meter towards the tower tangent is 4/3

Hence

$$\frac{3x}{4x-560} = \frac{4}{3}$$

9x=16x-2240

7x=2240

x=320

Height of tower is 3x= 3× 320=960meter

3. **Direction:** What value should come in place of the question mark (?) in the following equation?

4743^2 - (529+828+324)=?*4784A. 4784

A. 4742 B. 4702

C. 4778 D. 4384

Ans. C

Sol. $(4743)^2$-{(23^2)+(2*18*23)+(18^2)} = ?*4784

$(4743)^2$-$(23+18)^2$= ?*4784

$(4743)^2$-41^2= ?*4784

=4784*4702 = ?*4784

?=4702

4. Ramvir travelling at certain speed, can cover 25 km upstream and 39 km downstream in 8 hours. At the same speed, he can travel 35 km upstream and 52 km downstream in 11 hours. The speed of the stream is:

A. 3 km/hr
B. 4 km/hr
C. 5 km/hr
D. 6km/hr
E. None of these

Ans. B

Sol. Let the speed of Ramvir in still water and speed of stream be x & y kmph respectively.

According to question,

$$\frac{25}{(x-y)} + \frac{39}{(x+y)} = 8 \quad ....(i)$$

And

$$\frac{35}{(x-y)} + \frac{52}{(x+y)} = 11 \quad ....(ii)$$

From (i),

$25(x + y) + 39(x - y) = 8(x^2 - y^2)$

$\Rightarrow 25x + 25y + 39x - 39y = 8(x^2 - y^2)$

$\Rightarrow 64x - 14y = 8(x^2 - y^2)$ ....(iii)

From (ii),

$35(x + y) + 52(x - y) = 11(x^2 - y^2)$

$\Rightarrow 35x + 35y + 52x - 52y = 11(x^2 - y^2)$

$\Rightarrow 87x - 17y = 11(x^2 - y^2)$ ....(iv)

On Solving equation (iii) and (iv), we get

x = 9 kmph and y = 4 kmph

Required speed of the stream = y = 4 kmph

5. Three persons start running at the same time from the same point. Their speeds are 9 km/h, 13 km/h and 10 km/h respectively. If they are running on an 8 km-circular road, then after how much time will they meet at the starting point?

A. 8 hrs
B. 10 hrs
C. 16 hrs
D. 24 hrs

Ans. A

Sol. Speed of the first person = 9 km/hr

It means he covers 9 km in 1 hour. So, in covering the complete round of 8 km, first person will take (8/9) hrs.

Similarly, second and third persons will take (8/13) & (8/10) hours respectively.

Hence, required time = L.C.M of (8/9), (8/13) & (8/10)

=[LCM of (8,8,8)]/[HCF of (9,13,10)] = 8/1 = 8 hours

6. Sanjay and Mohit entered into a partnership by investing Rs. 12000 and Rs. 18000 respectively. After 4 months Sanjay withdrew Rs. 3000 while Mohit invested Rs. 3000. After another 2 months, Praveen joins the business with a capital of Rs. 15000. The profit share of Sanjay exceeds that of Praveen, out of a total profit of Rs. 38400 after one year by:

A. Rs. 2560
B. Rs. 2550
C. Rs. 2480
D. Rs. 2490
E. None of these

Ans. A

Sol. Ratio of profit share of Sanjay, Mohit and Praveen

= (12000 × 4 + 9000 × 8) : (18000 × 4 + 21000 × 8) : (15000 × 6)

= (48 + 72) : (72 + 168) : 90 = 120 : 240 : 90

= 20 : 40 : 15

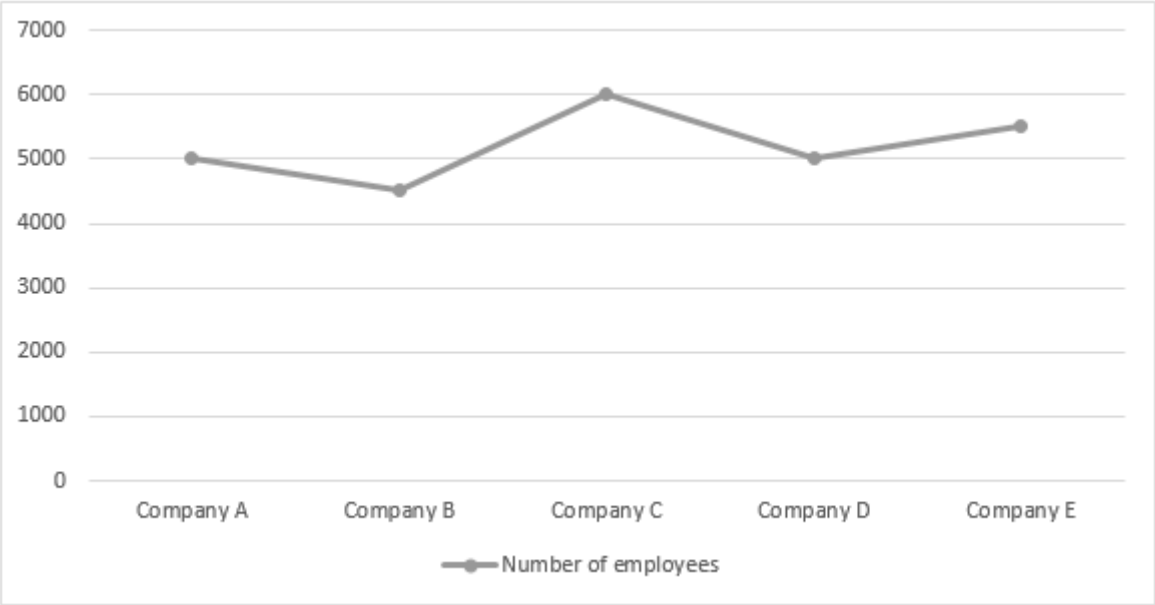
Required Difference $= \frac{5}{75} \times 38400 = 5 \times 512$ = Rs. 2560

7. **Direction**: Answer the following question based on the given information.

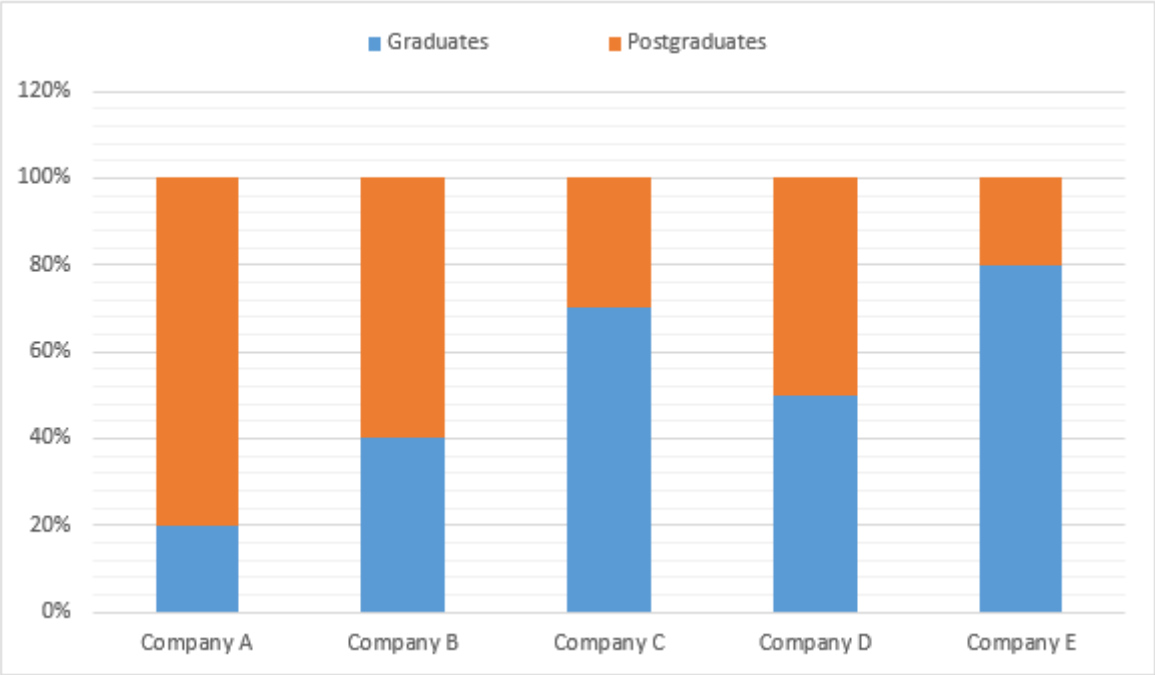
The table shows the distribution of a company's employees in various departments.

	ACCOUNTS	SALES	MARKETING	HR
Company A	22%	34%	23%	21%
Company B	11%	20%	35%	34%
Company C	18%	30%	21%	31%
Company D	23%	25%	27%	25%
Company E	22%	24%	26%	28%

The graph gives the information about the total number of employees



The bar graph shows the distribution of employees between graduates and postgraduates.



which company has the highest number of postgraduate employees?

A. Company A
B. Company B
C. Company C
D. Company D
E. Company E

Ans. A

Sol. Number of employees in Company A = 5000
Percentage of postgraduate employees in Company A = 80%
Number of postgraduate employees in Company A = 4000
Number of employees in Company B = 4500
Percentage of postgraduate employees in Company B = 60%
Number of postgraduate employees in Company B =2700
Number of employees in Company C = 6000
Percentage of postgraduate employees in Company C = 30%
Number of postgraduate employees in Company C = 1800
Number of employees in Company D = 5000
Percentage of postgraduate employees in Company D = 50%
Number of postgraduate employees in Company D = 2500
Number of employees in Company E = 5500
Percentage of postgraduate employees in Company E = 20%
Number of postgraduate employees in Company E =1100
Company A has the highest number of postgraduate employees.

8. If you combine the employees of different departments for all companies, which department will have the highest number of employees?

A. Marketing B. HR

C. Sales D. Accounts

E. All have equal number of employees

Ans. B

Sol. Number of employees in Company A = 5000

Percentage of HR in Company A = 21%

Number of HR in Company A = 1050

Number of employees in Company B = 4500

Percentage of HR employees in Company B = 34%

Number of HR employees in Company B = 1530

Number of employees in Company C = 6000

Percentage of HR employees in Company C = 31%

Number of HR employees in Company C = 1860

Number of employees in Company D = 5000

Percentage of HR employees in Company D = 25%

Number of HR employees in Company D = 1250

Number of employees in Company E = 5500

Percentage of HR employees in Company E = 28%

Number of HR employees in Company E = 1540

Total number of HR employees = 1050 + 1530 + 1860 + 1250 + 1540 =7230

Number of employees in Company A = 5000

Percentage of Accounts in Company A = 22%

Number of Accounts in Company A = 1100

Number of employees in Company B = 4500

Percentage of Accounts employees in Company B = 11%

Number of Accounts employees in Company B = 495

Number of employees in Company C = 6000

Percentage of Accounts employees in Company C = 18%

Number of Accounts employees in Company C = 1080

Number of employees in Company D = 5000

Percentage of Accounts employees in Company D = 23%

Number of Accounts employees in Company D = 1150

Number of employees in Company E = 5500

Percentage of Accounts employees in Company E = 22%

Number of Accounts employees in Company E = 1210

Total number of Accounts employees = 1100 + 495 + 1080 + 1150 + 1210 = 5035

Number of employees in Company A = 5000

Percentage of Sales in Company A = 34%

Number of Sales in Company A = 1700

Number of employees in Company B = 4500

Percentage of Sales employees in Company B = 20%

Number of Sales employees in Company B = 900

Number of employees in Company C = 6000

Percentage of Sales employees in Company C = 30%

Number of Sales employees in Company C = 1800

Number of employees in Company D = 5000

Percentage of Sales employees in Company D = 25%

Number of Sales employees in Company D = 1250

Number of employees in Company E = 5500

Percentage of Sales employees in Company E = 24%

Number of Sales employees in Company E = 1320

Total number of sales employees = 1700 + 900 + 1800 + 1250 + 1320 = 6970

Number of employees in Company A = 5000

Percentage of Marketing in Company A = 23%

Number of Marketing in Company A = 1150

Number of employees in Company B = 4500

Percentage of Marketing employees in Company B = 35%

Number of Marketing employees in Company B = 1575

Number of employees in Company C = 6000

Percentage of Marketing employees in Company C = 21%

Number of Marketing employees in Company C = 1260

Number of employees in Company D = 5000

Percentage of Marketing employees in Company D = 27%

Number of Marketing employees in Company D = 1350

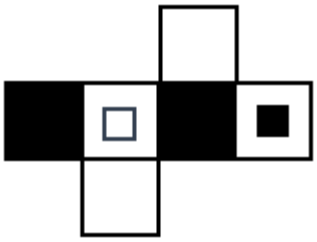
Number of employees in Company E = 5500

Percentage of Marketing employees in Company E = 26%

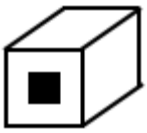
Number of Marketing employees in Company E = 1430

Total number of HR employees = 1150 + 1575 + 1260 + 1350 + 1430 = 6765

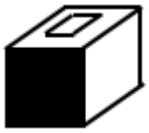
9. From the given options, which answer figure can be formed by folding the figure given in the question?



A. 

B. 

C. 

D. 

Ans. D

Sol. From the given figure we can say that,

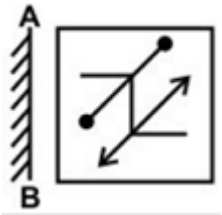
Both the black faces will be on opposite faces,

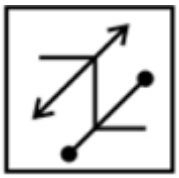
Both the white faces will be on opposite faces and

Filled square and blank square will be on opposite faces.

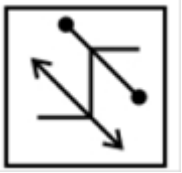
Thus cube at option D can be formed by folding the given figure.

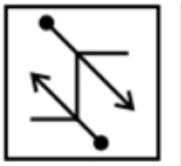
10. **If a mirror is placed on the line AB, then which of the answer figures is the right image of the given figure?**



A. 

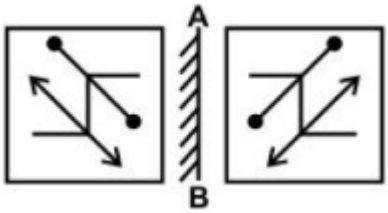
B. 

C. 

D. 

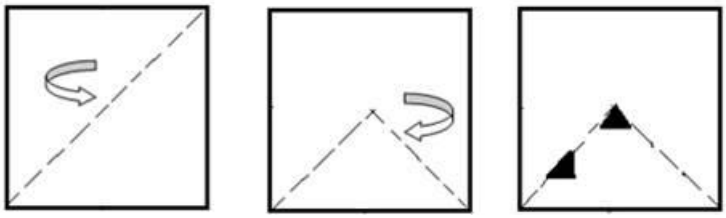
Ans. C

Sol. The mirror image is -

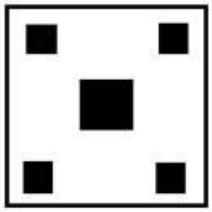


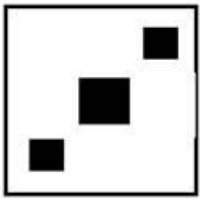
Hence, option C is the correct answer.

11. The sequence of folding a piece of paper and the manner in which the folded paper has been cut is shown in the following figure. How would this paper look when unfolded?



A. 

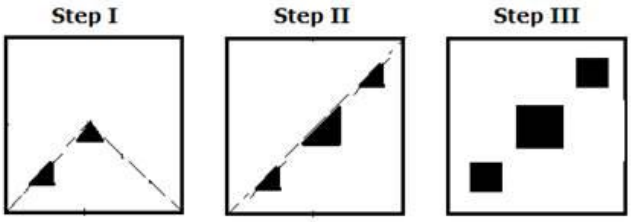
B. 

C. 

D. 

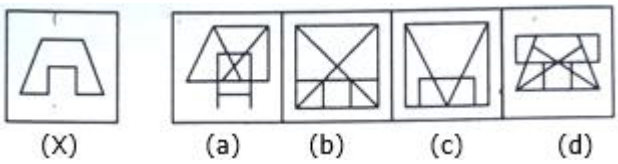
Ans. C

Sol. After unfolding the paper.



Hence, option C is the correct answer.

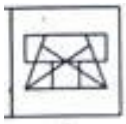
12. In each of the following questions, figure (X) are given followed by four alternative figures (a), (b), (c) and (d) such that figure (X) is embedded in one of them. Trace out the alternative figure which contains figure (X) as its part.



A. Figure (a)
B. Figure (b)
C. Figure (c)
D. Figure (d)

Ans. D

Sol. On close observation, we can see that fig. (X) is embedded in figure (d) as shown below.



Hence, option D is the correct answer.

13. **Direction:** Study the following information carefully and answer the question given below.

There are five persons, David, Dravid, Dylan, Drake, and Diego. Two of them works in Google while the other three works in three different companies-TCS, Sony and Samsung. One of the persons who work in Google and the one who works in Samsung live in the same city-Mumbai. The other three live in three different cities-Pune, Delhi and Bangalore. Two of these five persons have Rolex while the remaining three have different watches-Titan, Sonata, and Maxima. The one who works in Samsung is the tallest in the height while one of the persons who work in Google likes Blue colour is the shortest. The other person who works in Google likes Pink colour which is liked by none and height wise lies exactly between the one who works in TCS and the one who works in Samsung. Drake likes Pink colour and lives in Mumbai while Diego has Sonata and lives in Bangalore. The one who works in TCS has Titan and lives in Pune. Dravid has Maxima while David has Rolex and likes a Blue colour which is liked by none.

Who among the following works in TCS?

A. The one who lives in Mumbai
B. The one who likes Maxima
C. Dylan
D. The one who likes Sonata
E. Can't be determined

Ans. C

Sol. From the direct information, we can form the following table-

Name	Company	City	Watch	Color	Height wise
David			Rolex	Blue	
Dravid			Maxima		
Dylan					
Drake	Google/Samsung	Mumbai		Pink	
Diego		Bangalore	Sonata		

Samsung-tallest,

1 Google-blue-Shortest

Height: Samsung > Google-Pink>TCS

TCS-Titan-Pune

As only Drake likes Pink color and he lives in Mumbai so he must work in Google. Also, David must also work in Google as he likes Blue color and is the shortest one. As the one who works in TCS lives in Pune and has Titan, he must be Dylan according to the space left. This implies that Drake likes Rolex. The one who works in Samsung lives in Mumbai so he must be Dravid. This implies that Diego works in Sony and David lives in Delhi. Also, Dravid is the tallest, Dylan is 2nd tallest. Drake is 3rd tallest and Diego is 2nd shortest.

The final table is shown below:

Name	Company	City	Watch	Color	Height wise
David	Google	Delhi	Rolex	Blue	5(shortest)
Dravid	Samsung	Mumbai	Maxima	-	1(tallest)
Dylan	TCS	Pune	Titan	-	3
Drake	Google	Mumbai	Rolex	Pink	2
Diego	Sony	Bangalore	Sonata	-	4

14. A man said to a lady, 'Your mother's husband's sister is my mother.' How is the man related to the lady?

A. Cousin
B. Brother
C. Son
D. Nephew

Ans. A

Sol. Lady's mother's husband is lady's father; whose sister is lady's aunt. Man is the son of lady's aunt, so man is the cousin of lady.

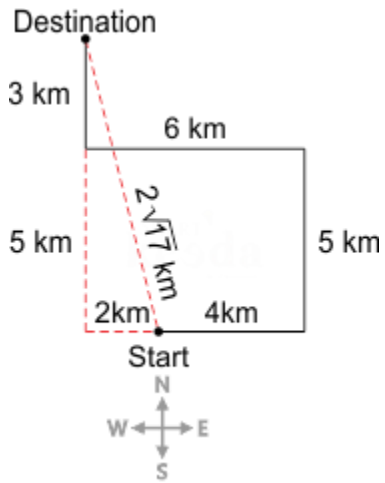
15. Shivam started walking in east direction for 4 km and then turned to his left and walked a distance of 5 km. Then he again turned to his left and walked 6 km. After taking right from his previous position he walked for 3 km and reached his destination.

Find the shortest distance and direction of Shivam's destination from his starting point?

A. 4√17 km east
B. 2√17 km, North-West
C. 5 km, North
D. 3√16 km. North-West

Ans. B

Sol. From the following image it is clear that the shortest distance between Shivam's starting point and destination is 2√17 km and his destination is in the north-west direction from the starting point.



$= 8^2 + 2^2$

$= 64 + 4$

$= \sqrt{68} \Rightarrow 2\sqrt{17}$

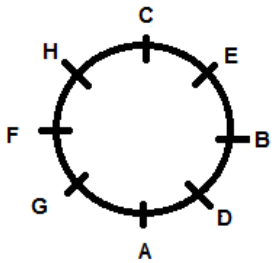
Hence option B is the correct answer.

16. Eight people A, B, C, D, E, F, G and H are sitting around a circle facing the centre. E sits third to the right of A who is to the immediate left of D who is second to the right of G. F is second to the left of A. H is not an immediate neighbour of E. C sits second to the right of B. What is C's position with respect to A?

A. Third to the right
B. Second to the right
C. Fourth to the right
D. None of these

Ans. C

Sol. As per the given information:



C sits fourth to the right of A.

Hence, option C is the correct answer.

17. A series is given with one term missing. Select the correct alternative from the given ones that can help complete the series.

512, 256, 128, ?, 32, 16, 8

A. 52
B. 61
C. 64
D. 56

Ans. C

Sol. Given: 512, 256, 128, ?, 32, 16, 8

$512\times\frac{1}{2}=256,\ 256\times\frac{1}{2}=128,\ \mathbf{128\times\frac{1}{2}=64},$

$64\times\frac{1}{2}=32,\ 32\times\frac{1}{2}=16 \text{ and } 16\times\frac{1}{2}=8$

Thus, 64 is the missing term.

512, 256, 128, **64**, 32, 16, 8

Hence, option C is correct.

18. In the following question, select the related number group from the given alternatives.

19 : 367 :: ? : ?

A. 21 : 447
B. 22 : 491
C. 29 : 850
D. 31 : 963

Ans. A

Sol. $367 = 19^2 + 6$

Similarly,

$447 = 21^2 + 6$

$491 = 22^2 + 7$

$850 = 29^2 + 9$

$963 = 31^2 + 2$

Hence, option A is the correct answer.

19. In a certain code language "FLUORENE" is written as "43168757" and "ELONGATE" is written as "73652907". How will "NEUTRAL" be written in that code language?

A. 5710893 B. 5710823

C. 5718693 D. 5710892

Ans. A

Sol. As,

F = 4,

L = 3,

U = 1,

O = 6,

R = 8,

E = 7,

N = 5,

G = 2,

A = 9,

T = 0

Thus code for "NEUTRAL" is "5710893".

Hence, option A is the correct answer.

20. In the following question, some statements followed by some conclusions are given. Taking the given statements to be true even if they seem to be at variance from commonly known facts, read all the conclusions and then decide which of the given conclusions logically follows the given statements.

Statements :

Some clever are intelligent.

No intelligent is Smart.

Conclusions :

I. Some intelligent are clever.

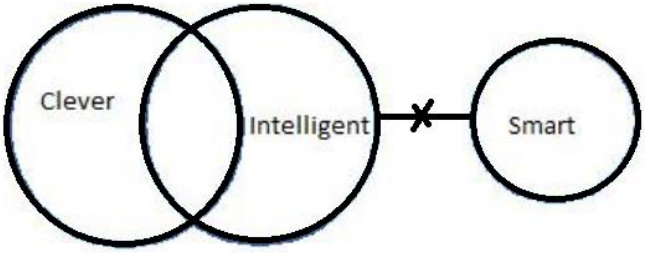
II. Some smart is clever.

A. Only conclusion I follows B. Only conclusion II follows

C. Both I and II follows D. Neither I nor II follows

Ans. A

Sol. The least possible Venn-diagram is:



Conclusions :

I. Some intelligent are clever - It is a definite case, hence true.

II. Some smart is clever - It is not a definite case, hence false.

So, only conclusion I follows.

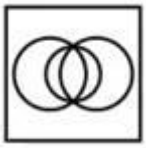
Hence, the correct option is **A**.

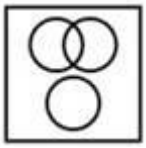
21. Identify the diagram that best represents the relationship among the given classes.

Green, Mango, Fruits

A. 

B. 

C. 

D. 

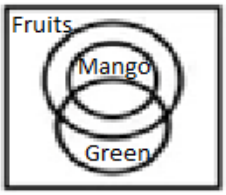
Ans. B

Sol. Mango is a subset of Fruits.

Some fruits are green

Some mango is also green.

Therefore, the above relation is clearly justified by:



Hence, option B is the correct answer.

22. **Directions:** In each of the following questions, one/two statements are given followed by two/three conclusions I, II and III. You have to consider the statements to be true even if they seem to be at variance from commonly known facts. You have to decide which of the given conclusions, if any, follow from the given statements.

Statement :

Sun is the source of light

Conclusions :

(I) Moon is not the source of light.

(II) Light has only one source.

A. Only conclusion (I) follows
B. Only conclusion (II) follows
C. Both conclusions (I) and (II) follow
D. Neither conclusion (I) nor (II) follows

Ans. D

Sol. From the given statement it cannot be concluded that moon is not the source of light or light has only one source. It is a general statement stating that sun is the source of light. It is not said that sun is the only source of light.

Hence neither conclusion (I) nor conclusion (II) follows.

23. **Direction**: Arrange the following words as per order in the dictionary.

1. Continuation
2. Contention
3. Contain
4. Continuous
5. Count

A. 32415
B. 32451
C. 31245
D. 32145

Ans. D

Sol. After arranging these word according to the Dictionary

Contain

Contention

Continuation

Continuous

Count

Hence, option D is the correct answer.

24. Name the Indian shooter who has won the gold medal in the men's 50m Rifle 3 Positions event at the ISSF World Cup in New Delhi?

A. Anish Bhanwala
B. Arpit Goel
C. Prithviraj Tondaiman
D. Aishwary Pratap Singh Tomar
E. Zoravar Singh Sandhu

Ans. D

Sol. • India's Aishwary Pratap Singh Tomar won gold in the men's 50m Rifle 3 Positions event at the ISSF World Cup in New Delhi.

• The 20-year-old became the youngest in history to win a shooting World Cup gold in the 3 Positions event.

• The two other Indian shooters in the final, Sanjeev Rajput finishing sixth and Niraj Kumar came at the last position.

25. Who has been sworn in as the 15th Chief Minister of Assam?

A. Sarbananda Sonowal
B. Himanta Biswa Sarma
C. Rama Kanta Dewri
D. Ram Prasad Sarmah
E. Rajdeep Roy

Ans. B

Sol. • Himanta Biswa Sarma has been named as the 15th Chief Minister of Assam on May 08, 2021. He will replace incumbent Sarbananda Sonowal.

• He took the charge of the office with effect from May 10, 2021.

• The BJP party won a second straight term in the 2021 assembly polls in the state.

• The party won 60 seats in the 126-member Assam assembly.

• Mr Sarma joined the BJP six years ago in 2015, after quitting the Congress.

26. The Reserve Bank of India has cancelled the license of Karnala Nagari Sahakari Bank Limited. The bank is located in which state?

A. Telangana
B. Andhra Pradesh
C. Odisha
D. Maharashtra
E. Rajasthan

Ans. D

Sol. • RBI has cancelled the license of Raigad based Karnala Nagari Sahakari Bank Limited and has been ceased to end its operation with immediate effects

• Order has been issued for winding up the bank and appoint a liquidator for the bank.

• RBI has informed that 95% of depositors will receive full amounts of their deposits

• On liquidation, every depositor will be entitled to receive deposit insurance claim amount of his/her deposits up to a monetary ceiling of Rs 5 lakhs

• License was cancelled due to inadequate capital and earning prospects and its continuance would have adversely affected depositors.

27. Veda Bhashya was written by_____

A. MK Gandhi
B. Jawaharlal Nehru
C. Swami Dayanand Saraswati
D. Ram Krishna Paramhans

Ans. C

Sol. **Veda Bhashya** was written by the Swami Dayanand Saraswati . He also wrote **Satyartha Prakash** and **Veda Bhashya Bhumika .**

• He also founded the first Arya Samaj unit in 1875 in Bombay.

• His motto was "**go back to the Vedas"** and "**India for the Indians".** His original name was Mula Shankar.

28. Loktak Lake is located in which state?

A. Meghalaya
B. Manipur
C. West Bengal
D. Sikkim
E. Uttar Pradesh

Ans. B

Sol. • **Loktak Lake is located in Manipur**.

• **Keibul Lamjao National Park** is located here, which is the only floating national park in the world. **"Loktak Day"** is observed every year on the 15th of October at the periphery of the Loktak lake.

• It serves as a source of water for hydropower generation, irrigation and drinking water supply. The lake is also a source of livelihood for the rural fishermen who live in the surrounding areas and on phumdis, also known as **"phumshongs".**

29. What is the mission of Smart City?

A. To integrate information and communication technology
B. To improve the efficiency of services
C. Better quality of life
D. All of the above

Ans. D

Sol. • A **smart city** is an urban development vision to integrate **information and communication technology** (ICT) and **Internet of things (IoT) technology** in a secure fashion to manage a city's assets.

• A smart city is promoted to use **urban informatics** and technology to improve the **efficiency of services** and**better quality of life**.

30. "Naval, military and air force works" is listed in the _____ list given in the Seventh Schedule in the Constitution of India.

A. Union
B. State
C. Global
D. Concurrent

Ans. A

Sol. "Naval, military and air force works" is listed in the union list given in the Seventh Schedule in the Constitution of India. There are three list , state list, union list and concurrent list in the 7th schedule of the indian constitution.

31. Header files include?

A. Boolean function
B. Void function
C. Library function
D. All of the above

Ans. C

Sol. Header files include Library functions.

A header file is a file with extension **.h** which contains C function declarations and macro definitions to be shared between several source files. There are two types of header files: the files that the programmer writes and the files that come with your compiler.

32. The expression 5 – 2 – 3 * 5 – 2 will evaluate to 18, if:

A. – is left associative and * has precedence over –

B. – is right associative and * has precedence over –

C. – is right associative and – has precedence over *

D. – is left associative and – has precedence over *

Ans. C

Sol. 5 – 2 – 3 * 5 – 2 will yield 18, if it is treated as (5 – (2 – 3)) * (5 – 2) i.e. if – has precedence over

* and if it associates from the right.

33. Which is legal declaration in C language?

A. char *str = "Shyam is a brilliant student";

B. int str[60] = "Shyam is a brilliant student";

C. float str[30] = "Shyam is a brilliant student";

D. char[] str = "Shyam is a brilliant student";

Ans. A

Sol. In char *str = "Shyam is a brilliant student" there is a pointer and it is an array in itself so it can easily be assigned. In char[] str = "Shyam is a brilliant student" size of array is not defined which is illegal declaration. The other two options are having 'int' and 'float' which is also illegal for assigning any group of words.

34. Assume that enqueuing and dequeuing operation take O(V) time each, during BFS algorithm on a graph. What would be the worst-case time complexity of BFS algorithm? (V is the number of vertices in the graph and graph is given as input to BFA [Bellman ford algorithm] in the form of adjacency list).

A. $O(V^3)$

B. $O(V^2 E)$

C. $O(V^2)$

D. $O(V)$

Ans. C

Sol. In normal BFS both enqueuing and dequeuing operation takes O(1) but in this algorithm it takes O(V) time.

All the vertices will be enqueued and dequeued once.

$\therefore V(V + V) = O(V^2)$ times

Adjacency list is scanned for every vertex, when it is dequeued. So overall O(E) time to scan adjacency lists

$\therefore O(V^2 + E) = O(V^2)$

35. Tower of Hanoi uses?

A. Backtracking
B. Divide and Conquer
C. Recursion
D. Greedy algorithm

Ans. C

Sol. The Tower of Hanoi is a mathematical puzzle that consists of three poles and a number of disks of different sizes. The puzzle starts with the disk arranged in ascending order on one pole. The objective of the puzzle is to move the entire stack to another pole. This involves simple recursion.

36. Consider the following function recursion(a, b). What is the value of recursion(8,6)?

```
int recursion(int a, int b)
{
if (a == 0)
return b;
return recursion( a -1, a + b);
}
```

A. 41
B. 34
C. 42
D. 36

Ans. C

Sol. The function recursive() returns ((1+ 2 + … + x-1 + x) + y) $\rightarrow$ x(x + 1)/2 +y $\rightarrow$ 8(8 + 1)/2 +6 $\rightarrow$ 36+6 $\rightarrow$ 42

37. Which of the following is true for input restricted double-ended queue?

A. Insertion and deletion is restricted from either of the ends.
B. Insertion is restricted from left end and deletion is restricted from right end
C. Insertion is allowed from both end.
D. None of these.

Ans. D

Sol. In input restricted double ended queue deletion is allowed at both ends where as insertion is restricted from either of the ends.

38. What will be the output of the following program? Assume address takes 2 bytes.

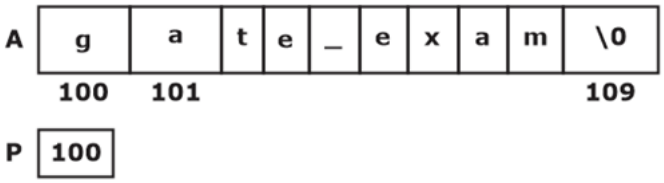
```
void main( )
{  char *P;
    char A[] = "gate_exam";
 P = A;
printf ("%u, %u", sizeof(A), sizeof(P));
}
```

A. 10, 2 B. 11, 2

C. 10, 10 D. 11, 11

Ans. A

Sol.



A is an array of size 9.

Null character is stored at the end of array to terminate the string.

Size of (A) = 10 but string length is 8.

Size of (P) = 2 where P stores address of A and a null character.

Therefore, output is 10, 2

39. What will be the output of the program?

```
#include<stdio.h>
int main()
{
    int i;
    i = scanf("%d %d", &i, &i);
    printf("%d\n", i);
    return 0;
}
```

[if input given is 100,101]

A. 1 B. 2

C. Garbage value D. Error: cannot assign scanf to variable

Ans. B

Sol. scanf() returns the number of variables to which you are provding the input.

i = scanf("%d %d", &i, &i); Here Scanf() returns 2. So i = 2.

printf("%d\n", i); Here it prints 2.

40. What is the output of the following C-code?

#include<stdio.h>

```
int main()
{
        int a=2;
        int b,c = 3, d = 5, k = 7;

        b = c < d + c++ * d++ || 1 && k++ ;
        printf("%d %d %d %d", b,c,d,k);
        return 0;

}
```

A. 35 4 6 8
B. 1 4 6 8
C. 1 3 5 7
D. 1 4 6 7

Ans. D

Sol. According to precedence ++ should be done first and associativity is R to L

c++ * d ++ = 3 * 5 = 15

c = 4, d =6

Next + will be done

c<d+15 = c< 21

4<21 //True result 1

1 || Anything //We got one side of OR is true, due to short-circuiting of the OR operator we won't evaluate the right side.

b = 1, c = 4, d = 6 k = 7

41. Consider a LAN with an average source and destination 1000 meters apart and the propagation delay is 40 μs. At what data rate does the round trip delay equal to transmission delay for 512 B packets?

A. 51.2 Mbps
B. 204.8 Mbps
C. 1024 Mbps
D. 409.6 Mbps

Ans. A

Sol. d = 1000 metres (distance)

T_P = 40 μs; L = 512 B = 512 × 8 bits

Round trip time (RTT) = 80 μs

$\boxed{L = BR}$

$512 \times 8 = B \times 80 \times 10^{-6}$

$\Rightarrow B = \frac{512}{10} \times 10^6$

= 51.2 Mbps

42. Which of the following Application Layer Protocol cannot be used between mail server and receiver's client machine?

A. HTTP B. SMTP

C. POP3 D. IMAP4

Ans. B

Sol. • POP3 and IMAP4 are well-known pull protocols used between the receiver's client and mail server.

• In Web Based Protocol, HTTP works as a push and pull protocol.

• SMTP is a well-known push protocol, it cannot be used between the receiver's client and mail server.

So, option B is the correct answer.

43. The transport layer protocols used for TFTP, SNMP, SMTP, RIP?

A. TCP, TCP, TCP, UDP B. UDP, TCP, TCP, UDP

C. UDP, UDP, TCP, UDP D. UDP, UDP, UDP, UDP

Ans. C

Sol. • Trivial File Transfer Protocol (TFTP) process includes flow and error control. It can easily use UDP.

• UDP is used for management processes such as SNMP.

• SMTP uses TCP.

• UDP is used for some route updating protocols such as Routing Information Protocol (RIP).

44. In GB5, we want to send 15 packets and every 7th packet lost then number of transmission required is _____.

A. 33 B. 30

C. 17 D. 23

Ans. A

Sol. Packet sequence needed is:

1 2 3 4 5 6 <u>7</u> 8 9 10 11 7 8 <u>9</u> 10 11 12 13 9 10 <u>11</u> 12 13 14 15 11 12 <u>13</u> 14 15 13 14 15

So, the number of transmissions requires is 33.

45. The length of a packet for customized 25Mbps Ethernet link is 8 bytes. What will be the transmission delay (in microseconds)?

A. 0.32 B. 3.125

C. 0.390 D. 2.56

Ans. D

Sol. The transmission delay can be calculated as:

= length of the packet / transmission rate

= 8 Bytes / 25 Mbps

= (8 * 8) bits / 25 Mbps

= 64 / 25

= 2.56

Thus, Option D is correct.

46. If the bandwidth of the line is 1.5 Mbps, RTT is 45 msec and packet size is 1 KB, then find the transmission delay?

A. 6.4ms
B. 7.4ms
C. 5.4ms
D. 22.5ms

Ans. C

Sol. Given-

Bandwidth = 1.5 Mbps

RTT = 45 msec

Packet size = 1 KB

Transmission delay (T_t) = Packet size / Bandwidth

= 1 KB / 1.5 Mbps

= (2^{10} x 8 bits) / (1.5 x 10^6 bits per sec)

= 5.461 msec

47. In OSI model, what are the responsibility of presentation layer ?

A. Code Conversion
B. Data Compression and Decompression
C. Data Encryption and Decryption
D. All of the above

Ans. D

Sol. Main functions of Presentation Layer:

1.Character-Code Translation

2.Data Conversion

3.Data Compression

4.Data Encryption and Decryption

5.Data Translation

48. Consider the two statements regarding Data Link Layer:

Statement 1: Data Link Layer attaches header as well as trailer to the data

Statement 2: Only Error Correcting Codes are attached as trailer at the data link layer

Which of the following is true regarding the above statements?

A. Statement 1 is true, and Statement 2 is the reason being S1 true

B. Statement 1 is false, and Statement 2 is the reason being S1 false

C. Statement 1 is true but S2 is not the correct explanation for statement 1

D. None of these

Ans. C

Sol. Statement 1: Data Link layer attaches header for adding the information about preamble and trailer to store the data about error correction and detection codes.

Statement 2: is false as the data link layer attaches the detection code also, as the trailer.

So, option C is the right answer.

49. Which topology has the highest reliability?

A. Mesh topology
B. Star topology
C. Bus topology
D. None of the above

Ans. A

Sol. Mesh topology has the highest reliability as all the nodes are connected to each other to form a mesh-like structure. Mesh Topology is a network setup where each computer and network device is interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections goes down. This topology is not commonly used for most computer networks as it is difficult and expensive to have a redundant connection to every computer. However, this topology is commonly used for wireless networks.

50. Consider the following statements with respect to application layer:

S_1 : Datagram uses PDU (Protocol data unit).

S_2 : There is a fixed limit on the maximum size of data that it can pass on the TCP layer.

Which of the following options is correct?

A. Only S1 is true
B. Only S2 is true
C. Both S1 and S2 are true
D. Neither of S1 or S2 is true

Ans. D

Sol. • Message is the PDU used by the application layer.

• There is no limit on the maximum size of data that it can pass on the TCP layer. Application layer can generate any amount of data, its the responsibility of TCP layer to break the message into segment and transmit. Application layer can send any amount of data to transport layer.

So, both of the statements are false. Hence, option D is the correct answer.

51. To accept string "abb" how many states should be there in minimal DFA?

A. 4
B. 5
C. 3
D. none of the above

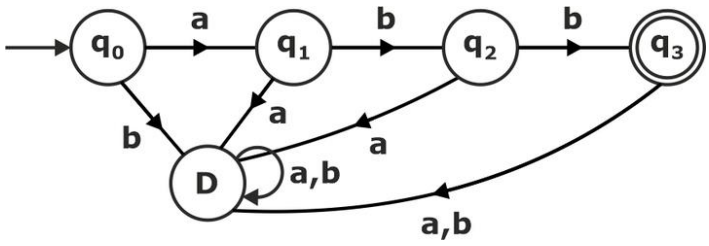
Ans. B

Sol. Assuming you want the automata to only accept string abb, you can construct a DFA to accept this string with 5 nodes.

The start node that leads to the following 3 state for input abb, and to the dead state for any other input.

3 nodes for a, b and b, where b is an accepting state and any incorrect inputs lead to the accepting state.

Finally, the dead state which is not an accepting state and where any input loops back to itself.



52. Let S and T be language over ={a,b} represented by the regular expressions (a+b*)* and (a+b)*, respectively. Which of the following is true?

A. S ⊂ T (S is a subset of T)
B. T ⊂ S (T is a subset of S)
C. S=T
D. S ∩ T=Ø

Ans. C

Sol. By property of regular expression:
(a+b)*=(a*+b*)*= (a+b*)*=(a*+b)*=(a*b*)*

53. If we give a string of length 'n' as input then which one of the following will give the output of length 'n+1'?

A. Mealy machine
B. Moore machine
C. In both A) and B)
D. Neither in A) nor B)

Ans. B

Sol. In case of Moore machine, if we provide a string of length 'n' as input then it will give output of 'n+1' symbols.
Moore machine is a finite state machine in which the next state is decided by the current state and current input symbol. The output symbol at a given time depends only on the present state of the machine.

54. Which of the following problem is undecidable?

A. Membership problem for CFG
B. Ambiguity problem for CFG
C. Finiteness problem for FSA
D. Equivalence problem for FSA

Ans. B

Sol. Ambiguity problem for CFG is undecidable.
Membership problem for CFG is decidable because CYK algorithm exist.
Finiteness problem is decidable for FSA since there exist algorithm to regularity of a problem
Equivalence problem is also decidable for FSA.

55. Consider the following languages:
L1= $\{a^n b^n\ (n \geq 0)\}$
L2= Complement (L1)
Choose appropriate options regarding languages L1 and L2.

A. L1& L2 are context free
B. L1 is CFL but L2 is RL

C. L1 is CFL and L2 is CSL

D. None

Ans. A

Sol. $L1$ is CFL and $L2=\{a^p b^q / p \neq q \text{ and } p,q>1\}$ which is CFL. For L1 we can form pushdown automata. we push 'a' in the stack and on input symbol b we pop a. Similar we can form for L2 also.[DCFL are closed under complementation]

56. Consider the DFA with alphabet set Σ={0,1,2} with designated initial state among the four states present in the DFA. Then how many DFA are possible with the above specification -

A. 16×4^3

B. 8×4^3

C. 16×4^{12}

D. 8×4^{12}

Ans. C

Sol. If we draw the transition table of the DFA, it will be –

States	0	1	2
q0	(1 of 4)	(1 of 4)	(1 of 4)
q1	(1 of 4)	(1 of 4)	(1 of 4)
q2	(1 of 4)	(1 of 4)	(1 of 4)
q3	(1 of 4)	(1 of 4)	(1 of 4)

Therefore, the number of DFA without any final state are 4^{12}

Now if we consider the final state also we get - $({}^4C_0 + {}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4) = (1+4+6+4+1) = 16$

So, Number of DFA = 16×4^{12}

57. Which of the following is a Regular language?

A. L1 = $\{wcw^R \mid w \in \{a, b\}^*\}$

B. L2 = $\{wcw^R \mid w,c \in \{a, b\}^*\}$

C. L3 = $\{ww^R c \mid w \in \{a, b\}^*\}$

D. L4 = $\{cww^R \mid w \in \{a, b\}^*\}$

Ans. B

Sol. B. is Regular language

L2 = $\{wcw^R \mid w,c \in \{a, b\}^*\}$

= {ε, a, b, ab, ba, aa, bb, aaa, …….}

= Σ* (When w = ε and c ∈ {a, b}*, we obtain L2 ⊂ Σ*, which is regular)

∴ L2 is Regular

58. Find the true statement from the following?

A. Turing machine halts for every input string.

B. Turing machine may or may not halt for every input string.

C. Turing machine never halts for every input string.

D. None of these.

Ans. B

Sol. Turing machine halts for every valid input string

Turing machine may or may not halt for invalid strings.

Turing machine may or may noty halt for input string.

∴ option B is correct.

59. Consider these 2 statements:

S1: $a^*.\varphi = a^*$

S2: $\varphi^* = \varphi$

Choose the correct statement.

A. Both are False

B. Both are True

C. S1 → True, S2 → False

D. S1 → False, S2 → True

Ans. A

Sol. $\varphi^* = \in$

$a^*\varphi = \varphi$

Therefore, both are false statements.

60. Consider a system having 30 instances of resources 'R' shared by 'n' process. Each process requires 4 instances of the resource. What is the maximum possible number of processes that must be allowed such that system is in a safe state?

A. 9

B. 8

C. 10

D. 11

Ans. A

Sol. Every process needs '4' instances. Hence giving '3' instances to each of the 8 processes will need 24 resources and the remaining 1 process will get all 4 resources. So total 9 processes.

61. Consider the below statements with respect to FCFS scheduling.

1) Waiting time can be large if short service requests wait behind the long service ones.

2) It is not suitable for time sharing systems where each user get the CPU for an equal amount of time interval.

3) A proper mix of jobs is needed to achieve good results from FCFS scheduling.

Which of the above statements are TRUE?

A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. All statements are correct.

Ans. D

Sol. All statements are true with respect to FCFS scheduling. Waiting time can be large if short requests wait behind long ones. For time sharing systems Round Robin scheduling is suitable where each user get the CPU for an equal amount of time interval. A proper mix of jobs is needed to achieve good results (less waiting time, turnaround time and response time) for FCFS scheduling.

62. Which of the following CPU scheduling algorithms can result in process starvation?

A. First-come first-serve
B. Shortest-job next
C. Round Robin Scheduling
D. Longest remaining job first

Ans. B

Sol. (A) The FCFS scheduling algorithm can lead to increased waiting time for processes if a long process starts executing, but there will be no starvation.

(B) The SJF algorithm on the other hand can lead to starvation, where a continuous stream of processes with shorter CPU bursts can prevent a process with longer CPU burst from getting the CPU.

(C) Round Robin worked on a time quantum no starvation.

(D) Longest remaining job first no starvation.

63. A quantum in round robin scheduling algorithm is:

A. The absolute minimum time that a process can run.
B. The maximum time that a process can run before being pre-empted.
C. The amount of time that a process runs before it blocks on I/O.
D. The fraction of a time slice during which the process is running.

Ans. B

Sol. A quantum in round robin scheduling algorithm is the maximum time that a process can run before being pre-empted

64. Which of the following is true about process aging?

A. Computing the next CPU burst time via a weighted exponential average of previous bursts.
B. The measurement of elapsed CPU time during a process' execution.
C. Boosting a process' priority temporarily to get it scheduled to run.
D. Giving a process a longer quantum as it gets older.

Ans. C

Sol. Aging means Boosting a process' priority temporarily to get it scheduled to run.

65. Consider the following statements given below:

S1: Round Robin scheduling algorithm always give better performance compared to first come first serve scheduling algorithm.

S2 : An advantage of system call is to provide an interface between running program and operating system.

Which of the above statements is/are incorrect?

A. Only S1
B. Only S2
C. Both S1 and S2
D. Neither S1 nor S2

Ans. A

Sol. S1: If the time quantum of the Round Robin scheduling algorithm is larger than the longest CPU burst time, this is not always correct that RR give better performance compared to FCFS, so S1 is incorrect.

S2: System call provides the services of the operating system to the user programs via Application Program Interface (API). It provides an interface between a process and operating system to allow user-level processes to request services of the operating system.

An advantage of system call to provide the interface between program and operating system. Thus, S2 is correct.

66. Consider the following statements S1 and S2:

S1: Paging causes external fragmentation.

S2: Paging solves internal fragmentation.

Which of the following is incorrect?

A. Only S1 B. Only S2

C. Both S1 and S2 D. None of the above

Ans. C

Sol. Paging causes internal fragmentation and paging solves external fragmentation.

Paging helps to solve external fragmentation in two ways:

- First, it subdivides memory into fixed-size adjacent chunks – the pages – that are "large enough" so they're never useless.
- Second, the paging hardware provides a level of indirection between application pages and physical memory pages.
- There is no external fragmentation in paging but internal fragmentation exists. Large pages will also waste more space with internal fragmentation.

67. Consider a system has 4 processes and three resource types A, B, C . Resource type A has 6 instances, B has 14 instances and C has 3 instances. The maximum requirement for each process and its current allocation are

	Allocation			Maximum		
	A	B	C	A	B	C
P_0	0	4	1	4	5	2
P_1	3	5	1	5	6	2
P_2	0	1	1	1	2	1
P_3	2	2	0	3	3	1

What is the safe sequence for the processes so they don't enter into the deadlock state?

A. P_1, P_3, P_2, P_0 B. P_2, P_3, P_0, P_1

C. P_2, P_3, P_1, P_0 D. P_3, P_2, P_1, P_0

Ans. C

Sol. Need matrix for processes is calculated as

	Allocation			Maximum			Need		
	A	B	C	A	B	C	A	B	C
P_0	0	4	1	4	5	2	4	1	1
P_1	3	5	1	5	6	2	2	1	1
P_2	0	1	1	1	2	1	1	1	0
P_3	2	2	0	3	3	1	1	1	1

Total allocated resources are (A,B,C) = (5, 12, 3)

So, remaining resources are (1, 2, 0)

Here, only request for P_2 can be completed.

Now remaining resources = (1, 2, 0) + (0, 1, 1) = (1, 3, 1)

This satisfies only resources for P_3

Now remaining resources = (1, 3, 1) + (2, 2, 0} = (3, 5, 1)

(3, 5, 1) satisfied the need for P_1.

Now remaining resources = (3, 5, 1) + (3, 5, 1) = (6, 10, 2)

Finally request for P_0 can be completed.

So only possible safe sequence is <P_2 P_3 P_1 P_0>

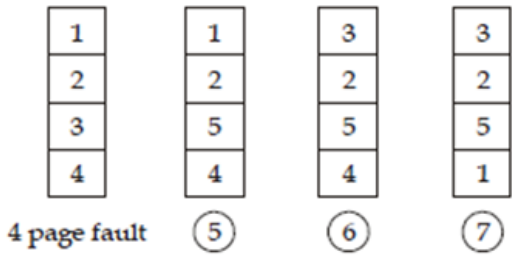
68. Assume that there are 4 pages frames which are initially empty, if the page reference string 1, 2, 3, 2, 1, 4, 5, 2, 3, 1, 2 then the number of page fault using the least recently used policy _____.

A. 6 B. 7

C. 5 D. 8

Ans. B

Sol. String 1, 2, 3, 2, 1, 4, 5, 2, 3, 1, 2



Total 7 pages faults.

69. Assume a table P has only one candidate key then which of the following is always true about P?

A. P is in both 3NF and BCNF
B. P is in 3NF but may not be in BCNF
C. P is in 2NF but may not be 3NF
D. None of these

Ans. D

Sol. Relation P has one candidate key P(A, B, C, D)

$A \rightarrow C$, $B \rightarrow D$ $(AB)^+ = ABC$

Key (AB)

P is not in 2NF because of partial dependency and not in 3NF and BCNF so option (d) is correct.

70. Key to represent relationship between tables is called?

A. Primary key
B. Secondary Key
C. Foreign Key
D. None of these

Ans. C

Sol. Foreign key is used to represent relationship between tables.

71. Which of the following statements is correct about E-R Model?

A. E-R Model is a way of structuring data using relations.
B. E-R Model consists of set of entities and relations among these entities.
C. E-R Model consists of a collection of records connected to one-another.
D. E-R Model consists of collection of data, organised into a tree-like structure.

Ans. B

Sol. According to the definition, E-R Model is one which consists of set of entities and the relation among these entities.

72. Supplier (sid, sname, rating)

Catalog (sid, pid)

Parts (pid, pname, cost)

What is the result of the following relational algebra expression:

$\pi_{sid,\ pid}$ (Catalog)/π_{pid} (Parts)

A. Sid of suppliers who supply at least one part.
B. Sid of suppliers who do not supply at least one part.
C. Sid of suppliers who supply all parts.
D. Sid of suppliers who do not supply all parts.

Ans. C

Sol. Output variable should be sid, since it is division operation returns Sid of suppliers who supply all parts.

73. Which of the following is correct about SQL?

A. An SQL query automatically eliminates duplicates

B. An SQL query will not work if there are no indexes on the relations

C. SQL permits attribute names to be repeated in the same relation.

D. None of these

Ans. D

Sol. SQL query will not automatically eliminate the duplicates, explicitly we have to use distinct keyword for removing duplicates from result set.

The SQL query will work even when there are no indexes on the relations. It is because SQL query could generate index automatically even when there is no indication of indexes.

SQL does not permit 2 attributes to have same name in a relation.

74. Which of the following statements(s) is/are false for relational DBMS?

I. ER diagrams are useful to logically model concepts.

II. Views in a database system are important because they help with access control by allowing users to see only a particular subset of the data in the database.

III. SQL is a procedural language.

A. I and III only

B. II and III only

C. III only

D. I and II only

Ans. C

Sol. I. A conceptual ER model may be used as the foundation for one as more logical data models.

III. SQL is not procedural language.

II is correct statement.

75. Which of the following is primary distinction between B and B^+ tree indices?

A. B^+ tree eliminates the redundant storage of search key value.

B. B tree eliminates the redundant storage of search key value.

C. Deletion in a B tree is more complicated.

D. None of these

Ans. B

Sol. B tree eliminates the redundant storage of search key because in B tree every node have similar structure.

Non leaf node also contains record pointer.

76. If every non-key attribute is functionally dependent on the primary key, then the relation will always be in?

A. 1NF

B. 2NF

C. 3NF

D. BCNF

Ans. C

Sol. If non-key attribute functionally dependent on the primary key, then the relation will always be in the 3NF. However, it may not in the BCNF because relational Schema R in BCNF iff every non trivial Functional dependency X -> Y with X must be super key

77. What error would the following function given on compilation?

```
f(int a, int b)
{
int a ;
a = 20;
return a;
}
```

A. Missing parentheses is return statement
B. Function should be defined as int f(int a, int b)
C. Redeclaration of a
D. None of these

Ans. C

Sol. Every Function should have a return type.

Here, we are declaring an existing variable 'a' for the second time within the same function that will lead to an compilation error.

Note:

```
int foo( int a ) {
int a=22;
return a;
}
```

Here, int a is a formal argument. So , we cannot declare the same variable int a within the same function. Because, both int a & int a will be considered as local variable.

But,

```
int a=0;
int foo() {
int a=22;
return a;
}
```

Here, int a is a global variable. we can declare the same variable int a within the same function which will be consider as local variable. Within the function, int a has more priority than int a.

78. By default, members of a C++ Class are?

A. Private
B. Public
C. Protected
D. Inverted

Ans. A

Sol. C++ is an object-oriented programming language. There are three access modifiers in C++ Public, protected and private. Default access to members of a class is private.

79. What will be the output of following code:

```
int main()
{
int a = 1010;
printf("%o %x", a, a);
return 0;
}
```

A. 10 a
B. 12 A
C. A 10
D. 10 10

Ans. B

Sol. As %o is used to print the number in octal number format and %x is used to print the number in hexadecimal number format. And if we convert binary 1010 to octal, we get 12 and in hexadecimal, it will give A**.**

80. Which among the following can't be used for polymorphism?

A. Static member functions
B. Member functions overloading
C. Predefined operator overloading
D. Constructor overloading

Ans. A

Sol. Static member functions are not property of any object. Hence it can't be considered for overloading/overriding. For polymorphism, function must be property of object, not only of class.

81. If X, Y and Z are three exhaustive and mutually exclusive events related with any experiment and the P(X) = 0.5P(Y) and P(Z) = 0.3P(Y). Then P(Y) = _____.

A. 0.54
B. 0.66
C. 0.33
D. 0.44

Ans. A

Sol. For exhaustive & mutually exclusive event,

P(X) + P(Y) + P(Z) =1

⇒ 0.5 P(Y) + P(Y) + 0.3 P(Y) = 1

⇒ 1.8 P(Y) =1

⇒ P(Y) = 1 / 1.8 = 0.55555 = 0.54 (approx.)

82. The given expression: A + A'B + A'B'C + A'B'C'D + ... evaluates to ?

A. A + B + C + D.....
B. A + B + C
C. 1
D. 0

Ans. A

Sol. Suppose if we take these 4 terms A + A'B + A'B'C + A'B'C'D

$=A + A'[B+B'(C+C'D)]$

$= A + A'[B+B'(C+D)]$

$= A + A'[B+C+D)]$

$=A+B+C+D$

Since,

$X+X'Y=(X+X')(X+Y)$

$=1.(X+Y)$

$= X+Y$

83. The number of prime implicants, essential prime implicants, and the minimized expressions for the given function

F(A,B,C) = Σ(0,2,3,4,5,7) is?

A. 6,3,1 B. 3,3,2

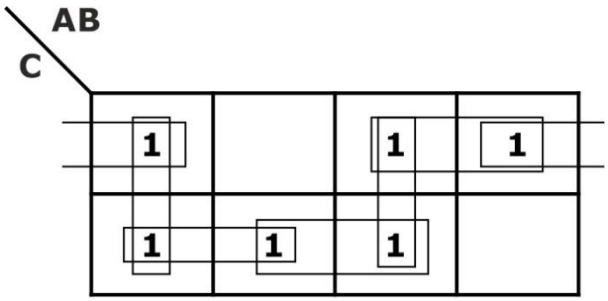
C. 6,3,2 D. 6,0,2

Ans. D

Sol. Prime implicant is a smallest possible product term in given function, removing any one of the literal from which is not possible.

Essential prime implicant is a prime implicant which should cover atleast one minterm, which is not covered by the other prime implicant.

So the K-map of the function with the grouping shown is as follows-



It clearly states that there are 6 prime implicants, 0 essential prime implicant and 2 minimized expression in it.

The k-map shown here is also called as a cyclic k-map.

84. Find the output of the following program.

```
main ()
{
extern int i ;
i = 20;
printf ("%d", i);
}
```

A. Linked error B. 20

C. Compiler error D. None of these

Ans. A

Sol. Linked error: Undefined symbol-i Extern int i;

Specifies to the compiler that the memory for i is allocated in some other program and that address will be given to the current program at the time of linking. But the linker finds that no other variable of the name 'i' is available in any other program with memory space allocated for it.

Hence linker error occurred.

85. Which of the following is a keyword used for a storage class in C programming?

A. printf
B. external
C. auto
D. scanf

Ans. C

Sol. Auto is the default storage class for all the variables declared inside a function or a block.

Auto variables can be only accessed within the block/function they have been declared and not outside them (which defines their scope). Of course, these can be accessed within nested blocks within the parent block/function in which the auto variable was declared. However, they can be accessed outside their scope as well using the concept of pointers given here by pointing to the very exact memory location where the variables reside. They are assigned a garbage value by default whenever they are declared. This is the default storage class for all the variables declared inside a function or a block. Hence, the keyword auto is rarely used while writing programs in C language.

86. Consider the following problems.

1. Longest common subsequence
2. Optimal Binary search tree
3. Fractional knapsack problem
4. Matrix chain multiplication

Which of the above problem can be solved using dynamic programming?

A. 1 and 2 only
B. 2 and 3 only
C. 1, 3 and 4 only
D. 1, 2 and 4

Ans. D

Sol. Longest common subsequence, longest increasing subsequence, sum of subsets, optimal BST, matrix chain multiplication, Travelling salesperson, Balanced partition, Fibonacci sequence, Multistage graph problems, 0/1 knapsack are solved by using dynamic programming.

87. In the Worst case, in Selection Sort, the total number of moves represented in order of_____?

A. O(logn)
B. O(n)
C. $O(n^2)$
D. $O(n^3)$

Ans. B

Sol. In selection sort, we exchange one by one by a minimum element of a subarray
So the total moves here we need is (n-1).
So, it's of O(n).

88. Which of the following sorting algorithm is a linear sorting algorithm?

A. Merge Sort
B. Quick Sort
C. Counting sort
D. Bubble Sort

Ans. C

Sol. Counting sort runs in O(n) time, making it asymptotically faster than comparison-based sorting algorithms like quicksort or merge sort.

89. There are 5 jobs to run on a machine they are (p1, p2,p3,p4,p5)= (100,10,15,27,30) and deadline (d1,d2,d3,d4,d5)= (2,4,2,1,3)
Find out the maximum profit if they are scheduled on machine for unit time.

A. 163
B. 165
C. 167
D. 170

Ans. C

Sol. To get the maximum profit we process the jobs p4, p1, p5, p4 -> their profits are = 100+27+30+10=167

90. Solve the following Recurrence Relation:

$$T(n)=\begin{cases}1 & \text{if } n=1\\ T\left(\frac{n}{2}\right)+c & \text{otherwise}\end{cases}$$

A. $O(n^3)$
B. O(logn)
C. O(n)
D. $O(n^2)$

Ans. B

Sol. $T(n)=T\left(\frac{n}{2}\right)+C$

$T\left(\frac{n}{2^2}\right)+C+C$

$=T\left(\frac{n}{2^3}\right)+C+C+C$

.

.

. for k value

.

$$= T\left(\frac{n}{2^k}\right) + k \times C$$

$$\frac{x}{2^k} = 1$$

log n = k

= T(1) + log n × C

T(n) = log n

91. Match the following:

A) Power of an element

B) Strassen's Matrix Multiplication

C) Merge Sort

D) Worst case of Job sequencing

1) $O(n^{2.8})$

2) O(logn)

3) O(nlogn)

4) $O(n^2)$

A. A - 2 B - 1 C - 4 D – 3

B. A - 2 B - 1 C - 3 D - 4

C. A - 3 B - 1 C - 2 D – 4

D. A - 4 B - 1 C - 3 D - 2

Ans. B

Sol. Power of an element recurrence relation

$$T(n) = T\left(\frac{n}{2}\right) + C, \text{ complexity} = O(\log n)$$

Strassen's matrix multiplication recurrence relation

$$T(n) = 7T\left(\frac{n}{2}\right) + 16n^2, \text{ complexity } = 0\left(n^{2.8}\right)$$

Merge sort recurrence relation

$$T(n) = 2T\left(\frac{n}{2}\right) + n, \text{ complexity} = O(n\log n)$$

Worst case job sequencing, complexity = $O(n^2)$

Hence, option = B

92. A hash function is defined as hash = value % 13, what will be the location of the value 67 after insertion of the following value 63, 54, 41, 90, 27, 190 67? (Use linear hashing)

A. 2

B. 3

C. 4

D. 6

Ans. C

Sol. If we map all value we can say that

63 → 11

54 → 2

41 → 3 i.e. 2 was already occupied

90 → 12

27 → 1

190 → 8

67 % 13 = 2 but 2 is not free neither 3 then move to 4

93. What is the best data structure to implement topological sort on directed graph?

A. Heap
B. Queue
C. Stack
D. Array

Ans. C

Sol. The best data structure used to implement topological sort is stack, since topological sort based on depth first traversal.

94. Which of the following will be true for worst case of Quick Sort?

A. T(n) = T(n/2) + O(n)
B. T(n) = 2T(n/2-1) + O(n)
C. T(n) = T(n-1) + O(n)
D. T(n) = T(3n/2-1) + O(n)

Ans. C

Sol. The worst case of quick sort occurs when the input array is already sorted, or reverse sorted and either of the extreme elements is picked as pivot element. In this case, quick sort divides the array into one sub problem with size 0 and other with size (n-1). So, recurrence will be T(n) = T(n-1) + T(0) + O(n) → T(n) = T(n-1) + O(n)

95. Match the following groups.

Group-I (n > 0)

A- $3n + 4n^2 + 5n\log n$

B- $n + \log n + \log\ \log n$

C- $10 + n + n\log n + \log n$

D- $10 + 10000 + 100000$

Group-II

1. $O(1)$

2. $O(\log\ n)$

3. $O(n)$

4. $O(n \log n)$

5. $O(n^2)$

A. A-5, B-3, C-4, D-2
B. A-5, B-4, C-3, D-1
C. A-5, B-3, C-4, D-1
D. A-5, B-4, C-3, D-2

Ans. C

Sol. $3n+4n^2+5n \log n = O(n^2)$

$n+ \log n+ \log \log n = O(n)$

$10+n+n\log n+\log n = O(n \log n)$

$10+1000+100000 = O(1)$

96. Job sequencing problem is an example of?

A. Dynamic programming
B. Greedy algorithm
C. Divide and Conquer
D. Branch and Bound

Ans. B

Sol. This problem consists of n jobs associated with a deadline and a profit. Our aim here is to maximize the profit by completing the job before given deadline. This can be easily done with greedy approach.

97. Arrange the following configuration for CPU in decreasing order of operating speeds

1) Hard wired control
2) vertical microprogramming
3) Horizontal microprogramming

A. 1>2>3
B. 1>3>2
C. 2>3>1
D. 3>2>1

Ans. B

Sol. Hard wired control involves only hardware, whereas microprogramming is software approach. So, hardwired control should be faster than both microprogramming approaches.

Between vertical and horizontal microprogramming. Horizontal is faster because in this control signals are not encoded whereas in vertical microprogramming to save memory signals are encoded. So, it takes less time in horizontal microprogramming because decoding of signals is not required. Therefore, final order is:

hard wired control > horizontal microprogramming > vertical microprogramming

98. In Flynn's classification of computers, the vectors and array classes of machines belong to?

A. Single instruction/Single data category
B. Single instruction/ Multiple data category
C. Multiple instruction/ Single data category
D. Multiple instruction/ Multiple data category

Ans. B

Sol. Single instruction/ Multiple data category

In Flynn's classification of computers, the vectors and array classes of machines belong to single instruction/ multiple data category.

99. Hardwired control units are faster than Micro-programmed control units because?

A. they do not consist of slower memory elements

B. they do not have slower element such as Gates and Flip-flops

C. they are made using faster VLSI design technology

D. they contain high speed digital components

Ans. A

Sol. Hardwired control units are generally faster than micro-programmed designs. Hardwired CU design uses a fixed architecture-it that requires changes in the wiring only if the instruction set is modified or changed but in Micro-programmed Control Unit, the control signals associated with operations are stored in special memory units as Control Words and thus make slower in speed because of the time it takes to fetch microinstructions from the control memory.

100. $(1217)_8$ is equivalent to?

A. $(1217)_{16}$

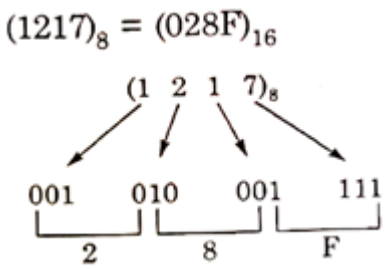
B. $(028F)_{16}$

C. $(2297)_{10}$

D. $(0B17)_{16}$

Ans. B

Sol.



101. _____ is used to choose between incrementing the PC or Performing ALU operations.

A. MULTIPLEXER

B. CONTROL UNIT

C. DATA BUS

D. CONDITIONAL CODES

Ans. A

Sol. The multiplexer circuit is choose among the two as it can give different results based on input.

102. The 2's complement representation of $(-539)_{10}$ in hexadecimal is?

A. ABE

B. DBC

C. DE5

D. 9E7

Ans. C

Sol. 2's complement representation of a negative number is determined as follows:

a. Compute a binary representation of the magnitude of the number

b. Take 2's complement of binary representation.

+ 539 = 0010 0001 1011

-539 = 1101 1110 0101 = $(DE5)_H$

103. The IEEE single-precision and double-precision format to represent floating-point numbers, has a length of _____ and _____ respectively.

A. 8 bits and 16 bits

B. 16 bits and 32 bits

C. 32 bits and 64 bits

D. 64 bits and 128 bits

Ans. C

Sol. The single precision format is 32 bits and the double precision format is of 64 bits.

104. Which of the following statements about IO modes are correct?

A. CPU doesn't take care of the IO operation in the programmed IO modes because the IO devices are directly connected to the system bus.

B. DMA module don't have direct access to the main memory and control over the system bus for transfer of the data.

C. DMA is inefficient for transferring bulk amount of data and programmed IO of small amount of data transfer.

D. None of the above

Ans. D

Sol. All of the above statements are incorrect.

Option A. It is false because CPU takes care of the IO operation in the programmed IO modes because the IO devices are directly connected to the system bus.

Option B. This option is also false because DMA module has direct access to the main memory and control over the system bus for transfer of the data.

Option C. This statement is wrong too as DMA is efficient for transferring bulk amount of data and programmed IO of small amount of data transfer.

So, all of the statements in the question are incorrect, therefore option D is the correct answer.

105. In Pipeline Stage of RISC processor, in which stage, the values are taken from the register?

A. Instruction Fetch

B. Instruction Decode

C. Write Back

D. Instruction Execute

Ans. B

Sol. In instruction decode stage, instruction is decoded and the register file is accessed to get the values from the registers used in the instruction.

In instruction fetch stage, CPU fetch the instruction from the memory based on PC. Simultaneously PC will be incremented to next sequential instruction address.

106. Consider the following instruction sequence:

I1: R1 = 100

I2: R1 = R2 + R4

I3: R2 = R4 – 25

I4: R4 = R1 + R3

I5: R1 = R1 + 30

The number of RAW, WAR, WAW dependencies are?

A. 3, 3, 3
B. 4, 3, 4
C. 0, 4, 3
D. 3, 3, 4

Ans. C

Sol. No of dependencies can be represented as follows:

WAW -3 : Between I1-I2, I1-I5 and I2-I5.

WAR - 4 : I2-I3, I2-I4, I3-I4, I4-I5

RAW - 0 : as there is no adjacent dependency.

So option C is correct.

107. Consider the following grammar

S→ABC

A→Aa|aB

B→Bb| ε

C→Cc| ε

The Follow(S) and Follow(C) is?

A. { $} and {$, b}
B. {$} and {$, a}
C. {$} and {$, c}
D. None

Ans. C

Sol. Follow(S) ={$} because no one is following S so by default for start symbol follow is $.

Follow(C)={c} ∪ Follow(S) = {$,c}

108. Identify the functionality of loader.

A. Allocation
B. Relocation
C. Loading.
D. All of these

Ans. D

Sol. The loader has following functionalities:

- Loading
- Linking
- Allocation

- Relocation

109. Match list-I with list-II and select the correct answer using the codes given below the lists:

List-I

A- Link-time

B- Load-time

C- Compile-time

D- Run-time

List-II

1- Resolving references

2- Relocation

3- Token recognition

4- Activation record

A. A-1, B-2, C-3, D-4

B. A-2, B-1, C-3, D-4

C. A-2, B-1, C-4, D-3

D. A-1, B-2, C-4, D-3

Ans. A

Sol. Link-time : References can be resolved.

Load-time: Relocation during loading.

Compile time : Token recognition during compilation.

Run time : Activation record created during run time.

In short:

1.**Link Time**: References/Symbol Resolution

2.**Load Time**: Relocation more specifically Absolute code Generation

3.**Compile Time**: Token Analysis in Lexical Analysis

4.**Run Time**: Activation record (Procedure are pushed into stack and sub procedure are taken in Consideration its all done at Run Time)

110. The idea of automation with a stack as auxiliary storage is supported by?

A. finite automata

B. Push Down Automata

C. Deterministic Automata

D. None of the mentioned

Ans. B

Sol. Push Down Automata manipulate the Stack as a part of performing a transition.

Pushdown Automata is a finite automaton with extra memory called stack which helps Pushdown automata to recognize Context-Free Languages.

111. The grammar after removing the left-recursion from the following grammar:

$E \rightarrow Ea \mid Eb \mid a \mid b$

A. $E \rightarrow aE' \mid bE'$; $E' \rightarrow aE' \mid bE' \mid \in$

B. $E \rightarrow aE' \mid bE'$; $E' \rightarrow aE \mid bE \mid \in$

C. E → aE'| bE'| ∈ ; E'→aE'| bE'| ∈ D. Both (A) and (B)

Ans. A

Sol. After removing the left recursion from the given grammar, it will become

E → aE'| bE'; E' → aE'| bE'| ∈

As a rule, is if A->Aa/B, then

A->BA' and A'->aA'/∈

112. Which of the following is not the token of C program?

A. #include B. "sum"

C. /* D. !

Ans. A

Sol. Except #include, all are considered as tokens. /*, if not ended by */ is also considered as token.

113. The number of tokens in the following C statement is?

printf("i = %d, &i = %x", i, &i);

A. 3 B. 26

C. 10 D. 21

Ans. C

Sol. In a C source program, the basic element recognized by the compiler is the "token." A token is source-program text that the compiler does not break down into component elements.

There are 6 types of C tokens : identifiers, keywords, constants, operators, string literals and other separators.

There are total 10 tokens in the above printf statement.

Below are tokens in above program.

printf $|_1$ ($|_2$ "i = %d, &i = %x" $|_3$, $|_4$ i $|_5$, $|_6$ & $|_7$ i $|_8$) $|_9$; $|_{10}$

114. What is the resultant of $[C4]_{16} - [7B]_{16} + [26]_8 = [\ ]_{16}$

A. $(5F)_{16}$ B. $(39)_{16}$

C. $(6F)_{16}$ D. $(49)_{16}$

Ans. A

Sol. $(C4)_{16} = 16^1 \times C + 4 = 16 \times 12 + 4 = (196)_{10}$

$(7B)_{16} = 16^1 \times 7 + B = 16 \times 7 + 11 = (123)_{10}$

$[26]_8 = 2 \times 8 + 6 = [22]_{10}$

Now, $[C4]_{16} - [7B]_{16} + [26]_8$

$= (196)_{10} - (123)_{10} + (22)_{10} = (95)_{10} = (5F)_{16}$

115. Without any additional circuitry, an 8 : 1 MUX can be used to obtain?

A. Some but not all functions of 3 variable.

B. None of the functions of 4 variables.

C. All functions of the 4 variables.

D. All functions of 3 variables and some but not all of 4 variables.

Ans. D

Sol. 8 : 1 MUX can be used to obtain

- All functions of 3 variables.
- Some but not all of 4 variables functions.

116. The race around condition occurs in a level triggered J-K flip-flop when?

A. Both the inputs are 0

B. Both the inputs are 1

C. J = 1 and K = 0

D. J = 0 and K = 1

Ans. B

Sol. In J-K flip-flop

J	K	Output
1	0	Set
0	1	Reset
0	0	Hold
1	1	Race around

117. Consider the following circuit:

The above circuit counts the range?

A. 0 to 1000

B. 0 to 29

C. 0 to 999

D. 0 to $(3 \times 2^{10} - 1)$

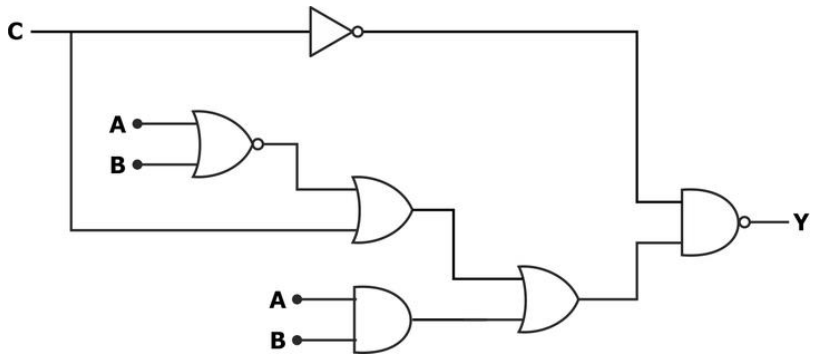
Ans. C

Sol. MOD of a BCD counter is 10. Here three BCD counters are cascaded.

So the overall MOD = 10 × 10 × 10 = 1000

Therefore it will count rom 0 to 999

118. In the circuit shown in the figure, if C = 0, the expression for Y is:



A. $Y = A\bar{B} + \bar{A}B$

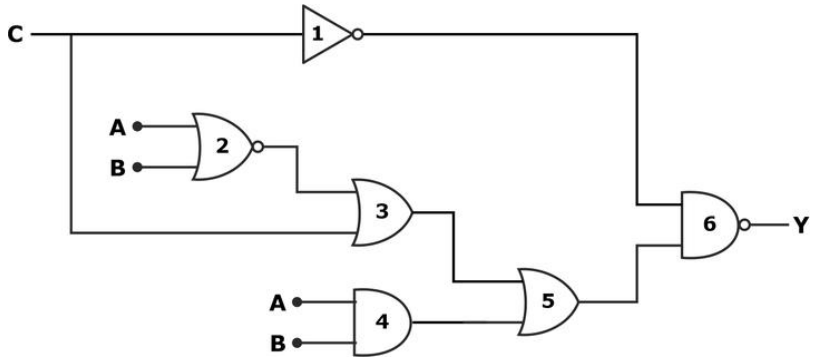
B. Y = A + B

C. $Y = \bar{A} + \bar{B}$

D. Y = AB

Ans. A

Sol.



Output of gate 1: $\bar{C}$

Output of gate 2: $\rightarrow \left(\overline{A+B}\right)$

Output of gate 3: $\rightarrow \left(\overline{A+B}+C\right)$

Output of gate 4: $\rightarrow AB$

Output of gate 5: $\rightarrow \left(\overline{A+B}+C\right)+AB$

Output of gate 6 is output Y i.e.

Using Demorgan's theorem $= C + \overline{\left(\overline{A+B}+C+AB\right)}$

$$= C + \left(\overline{\overline{A+B}}\right)\cdot\bar{C}\cdot\left(\overline{AB}\right)$$

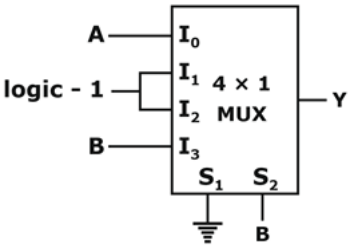
$$= C + (A+B)\cdot\bar{C}\cdot\left(\bar{A}+\bar{B}\right)$$

Given in equation $C = 0$,

So, $Y = 0 + (A+B)\cdot\bar{0}\cdot\left(\bar{A}+\bar{B}\right)$

$$= \bar{A}B + A\bar{B}$$

119. The logical expression of the output of the 4 × 1 multiplexer shown below is



A. AB

B. A + B

C. $A \oplus B$

D. $AB + \bar{B}$

Ans. B

Sol. Y= I0.S1'S2' + I1. S1'S2 + I2. S1S2' + I3.S1S2

Y=AB' + B = A+B

120. Given $(6y3)_x + (54)_x = 487$, what can be the possible value of base x and y respectively.

A. 10, 2

B. 8, 7

C. 11, 3

D. None of these

Ans. B

Sol. (i) x > y

(ii) x > 6

Now you will get an equation like this,

$6x^2 + xy + 5x - 480 = 0$

for this kind of equation, best way to solve is by using eliminate by option and you will see

x = 8, y = 7

$(673)_8 + (54)_8 = (487)_{10}$

$(443)_{10} + (44)_{10} = (487)_{10}$

121. Three fair cubical dice are thrown simultaneously. The probability that all three dice have the same number of dots on the faces showing up is (up to third decimal place) _____.

A. 1.5

B. 2.5

C. 0.028

D. 0

Ans. C

Sol. probability of getting 1 dot on all three dice is $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$

similar probability will be there for 2,3,4,5 and 6 so

Required probability

$= 6 \times (\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}) = 0.028$

122. The random variables X and Y have variances 0.2 and 0.5 respectively. Let Z= 5X-2Y. The variance of Z is?

A. 3 B. 4

C. 5 D. 7

Ans. D

Sol. Var(X) = 0.2, Var(Y) = 0.5

Z = 5X – 2Y

Var(Z) = Var(5X-2Y)

= Var(5X) + Var(2Y)

= 25Var(X) + 4Var(Y)

Var(Z) = 7.

123. Eigen values of a real symmetric matrix are always?

A. positive B. Real and imaginary

C. Negative D. real

Ans. D

Sol. An Eigen value of a real symmetric matrix is always real.

124. For two matrices A and B, we have the value of $(AB)^T$ equal to:

A. $A^T B$ B. $B^T A$

C. $A^T B^T$ D. $B^T A^T$

Ans. D

Sol. By definition and properties of transpose of matrix, we have:

$(AB)^T=B^T A^T$

125. Which of the given statements is true for the eigen values of the matrix $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$?

A. Both are negative B. One is positive, one is negative

C. Both are positive D. Both form a complex conjugate

Ans. B

Sol. The trace of the matrix is = 3+1 =4

The determinant is = 3-8 = -5

Thus, the characteristic equation is:

$\lambda^2-4\lambda-5=0$

given $\lambda=-1, 5$

126. The chromatic number of a graph is the property of _____

A. graph coloring B. graph ordering

C. group ordering D. group coloring

Ans. B

Sol. A graph coloring is an assignment of labels to the vertices of a graph such that no two adjacent vertices share the same labels is called the colors of the graph. Now, the chromatic number of any graph is the minimal number of colors for which such an assignment is possible.

Thus, the correct answer is B that is Graph ordering as Chromatic number is the assignment of colors to the vertices of Graph such that no two adjacent vertices have same color and ordering in a graph is related to number of vertices in the Graph.

127. _____ is the minimum number of vertices whose removal results in a disconnected graph or reduces it to a trival graph.

A. Vertex connectivity
B. Weakly connected
C. Strongly connected
D. Edge connectivity

Ans. A

Sol. Vertex Connectivity is the minimum number of vertices whose removal results in a disconnected graph or reduces it to a trival graph.

A digraph is a weakly connected if the underlying undirected graph is connected. A digraph is strongly connected if a path exists between any vertex to any vertex.

128. Simplest form of $\{\neg p(\neg q \wedge r) \vee (q \wedge r) \vee (p \wedge r)\}$ is

A. p
B. q
C. r
D. None of these

Ans. C

Sol. Given proposition $\equiv [\neg p(\neg q \wedge r) \vee (q \wedge r) \vee (p \wedge r)]$

$\equiv [\neg p \vee q \vee p \vee \neg q] \wedge r$

$\equiv$ True $\wedge$ r

$\equiv$ r

129. How many numbers of five digits can be formed from the numbers 2, 0, 4, 3, 8 when repetition of digits is not allowed?

A. 96
B. 144
C. 120
D. 14

Ans. A

Sol. Numbers are 2, 0, 4, 3, 8

Numbers can be formed = (Total) – (those beginning with 0)

= 5! – 4! = 96

130. There are 20 points in a plane, how many triangles can be formed by these points if 5 are colinear?

A. 1130
B. 550

C. 1129 D. 1140

Ans. A

Sol. Number of points in plane n = 20.

Number of colinear points m = 5.

Number of triangles from by joining n points of which m are colinear = ${}^{n}C_3 - {}^{m}C_3$

Therefore the number of triangles = ${}^{20}C_3 - {}^{5}C_3$ = 1140-10 = 1130.

131. Which of the following is correct about "telnet"?

A. It transfer web pages from web servers to clients.

B. It provide remote access to servers and networking devices.

C. It transfers e-mail messages and attachments.

D. telnet can also be used for file transfer.

Ans. B

Sol. Telnet provide remote access to servers and networking devices, its port number is 23. TELNET uses only one connection. It is a connection oriented protocol. Remote Login is necessary in TELNET.

132. Consider the following statements:

I. RIP uses distributed version of Bellman Ford algorithm.

II. RIP uses distance vector algorithm.

III. FTP uses port number 21 for data transfer.

Which of the above statement(s) is/are correct?

A. I and II only B. I and III only

C. II and III only D. II only

Ans. A

Sol. RIP uses a distributed version of Bellman-Ford algorithm. Bellman-Ford algorithm computes single-source shortest paths in a weighted graph (where some of the edge weights may be negative).

RIP uses distance vector algorithm.

FTP uses port number 20 for data and 21 for control connection.

133. Which one of the following devices reduces both collision domain and Broadcast domain to zero?

A. Repeater B. Hub

C. Router D. Switch

Ans. C

Sol. Option A Repeater are network devices operating at physical layer of the OSI model that amplify or regenerate an incoming signal before retransmitting it. They are incorporated in networks to expand its coverage area. They are also known as signal boosters. so repeater is not a collision domain separator. so Option A is Incorrect.

Option B, Hub is used as a centric device and it is not a collision domain separator

Switch reduces collision domain to zero. option B is incorrect.

Option C, A router not only breaks collision domains but also break broadcast domains, means it is both collision as well as broadcast domain separator. A router creates a connection between two networks. A broadcast message from one network will never reach the other one as the router will never let it pass. Option C is correct

Option D, Switch is collision domain separator but not a broadcast domain separator. option D is incorrect.

134. Consider two problem which are observed in wireless network:

1) Hidden Node Problem

2) Exposed Node Problem

Which of the following is true?

A. CSMA/CA suffers from Hidden Node Problem.

B. CSMA/CA does not suffer from Exposed Node Problem.

C. CSMA/CD suffers from Hidden Node Problem.

D. None of these

Ans. C

Sol. The problem which is faced by CSMA/CD is hidden node problem and Solution is provided by CSMA/CA, but CSMA/CA also suffers from exposed node problem.

135. Consider a network with IP address 172.60.50.2 and subnet mask 255.255.224.0, which of the following is the range of assignable IP address on the subnet in which the host belongs?

A. 172.60.32.1 – 172.60.63.254 B. 172.60.32.0 – 172.60.63.255

C. 172.60.32.1 – 172.60.64.255 D. 172.60.32.0 – 172.60.127.254

Ans. A

Sol.

$$\begin{array}{rl} \text{IP address} & = 172.60.50.2 \\ \underline{\text{Subnet mask}} & \underline{= 255.255.224.0} \\ \text{Subnet} & = 172.60.32.0 \end{array}$$

Address range which can be assigned to host 172.60.32.1-172.60.63.254

So option (A) is correct.

136. Consider efficiency of stop & wait ARQ is 10%. What is the efficiency (in percent) when selective repeat ARQ is used instead of stop and wait with 3 bit sequence number field?

A. 10% B. 40%

C. 80% D. 100%

Ans. B

Sol.

$$\eta_{stop\&wait} = \frac{T_t}{RTT} = \frac{1}{10}$$

Number of distinct sequences = 2^3 = 8

Sender sending window size (selective repeat ARQ) $= \frac{8}{2} = 4$

$$\eta_{pipline} = \frac{N \times T_t}{RTT} = \frac{4}{10} = 40\%$$

137. Ten thousand airline reservation stations are competing for the use of a single slotted ALOHA channel. On an average a station makes 36 requests/hour. Suppose a slot is 80 μsec. What is the approximate total channel load?

A. 0.08 request/slot
B. 0.008 request/slot
C. 0.06 request/slot
D. 0.006 request/slot

Ans. B

Sol. Total channel load = average requests / average slots number

Average requests for 10000 stations = 10000 × 36/ (60 × 60) = 100 requests/sec.

Average slots number = 1/(80 × 10^{-6}) = 12500 slots/sec.

Total channel load = 100/12500 = 0.008 request/slot.

138. Assume a slow start mechanism is used and assume there is no congestion. The round trip time is 20 ms and the maximum segment size is 24 KB . How much time is required to reach 24 KB of window size with packet size of 2 KB?

A. 50 ms
B. 40 ms
C. 120 ms
D. 80 ms

Ans. D

Sol. 1st RTT → 2 KB

2st RTT → 4 KB

3rd RTT → 8 KB

4th RTT → 16 KB

5th RTT → 24 KB

So, after 4th RTT we can send 24 kB of data.

So, 4 × 20 ms = 80 ms time is required to reach 24 kB of window size.

139. In IPv_4 datagram, offset value is non zero and in M (more fragment) bit is one, then what is the position of datagram?

A. First Fragment
B. Last Fragment
C. Intermediate fragment
D. Can't Determine

Ans. C

Sol. More Fragment Bit is (MF).

For all the intermediate fragment, more fragment bit MF =1 but for the last fragment more fragment bit MF=0.

In this question, more fragment bit is 1 so it is not a last fragment.

Fragment offset is non Zero so it is not the first fragment. So ,Option C is correct answer and it is the intermediate fragment.

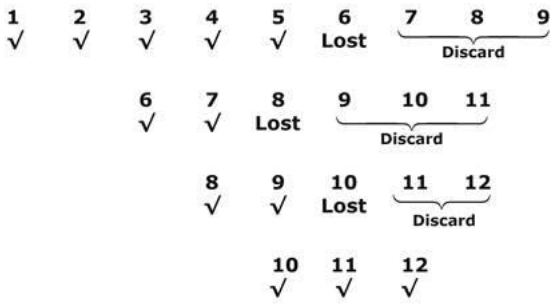
140. Suppose sender A wants to send 12 frames to receiver B, using Go Back 4 ARQ protocol. What is total number of transmissions by sender if every 6th transmission from sender gets lost (but not any ACK from receiver ever get lost)?

A. 12 B. 14

C. 18 D. 23

Ans. D

Sol.



141. Let G be grammar in CNF. Let w1, w2 ∈ L(G) such that |w1| < |w2|

A. Any derivation of w1 has exactly same number of steps as any derivation of w2

B. Some derivation of w2 may be shorter than of steps as any derivation of w1

C. All derivations of w1 will be shorter than any derivation of w2

D. None

Ans. C

Sol. Derivation always required 2n – 1 steps in CNF

n = length of the string.

G be a given CFG, W1 and W2 are two strings of the same length.

Suppose the following is the given CFG

S->Ab|bb

A->a

W1=bb W2=ab

W1 needs one derivation S->bb, And

W2 needs S->Ab->ab two derivations

Hence, (C) is the correct option.

142. Which of the following problems are decidable for CFLs?

A. Regularity
B. Totality
C. Equivalence
D. Finiteness

Ans. D

Sol. "Given CFL is regular or not" is undecidable.

"Given CFL = Σ*?" is undecidable

"Given CFL_1 & CFL_2 are same" is undecidable.

"Given CFL is finite?" is Decidable.

143. Consider the following languages L_1 and L_2:

$L_1 = \{a^m b^n | m, n \geq 0\}$

$L_2 = \{a^m b^n | m = n\}$

If $(L_1 \cup \overline{L_2}) = 1$ then what is the language L?

A. L = (a + b)*
B. $L = \{a^m b^n | m! = n\}$
C. $L = (a + b)^* - \{a^n b^n\}$
D. $L = (a + b)^* - \{a^m b^n \mid m! = n\}$

Ans. A

Sol. $L_2 = \{a^n b^n\}$, $L_1 = \{a^* b^*\}$

$L = (a^* b^*) \cup ((a + b)^* - \{a^n b^n\})$

$= (a + b)^*$

144. If G is a context free grammar and w is a string of length 10 in L(G). The length of derivation of w in G, if G is in Chomsky normal form is _____.

A. 19
B. 18
C. 17
D. None of above

Ans. A

Sol. A context free grammar G is in Chomsky normal form if all productions are in one of two simple form, either:

1. A → BC where A, B and C are variables, or
2. A → a where A is a variable and a is a terminal

So for any string of length n first production of type A → BC is used n – 1 times to produce sentential form of length n containing only variables and then each variable is replaced by a terminal using productions of

Type A → a, n times. So the length of derivation of string w of length n in CNF is (n – 1) + n = 2n – 1

2n – 1 = 2 × 10 – 1 = 20 – 1 = 19 steps

145. Number of two states DFA's with designated initial state can be constructed over the alphabet Σ = {0, 1} that accept empty language φ is _____.

A. 4
B. 20

C. 16 D. 24

Ans. B

Sol. case1:when no final state to be chosen.

then dfa possible=2^4 =16.

case2:when X is initial state and Y is final state but unreachable from X

then dfa possible =2^2 =4

therefore in total dfa possible is =16+4=20. Answer

146. Which of the following language has prefix property?

A. L = 01* B. L=0*1

C. L = 1* D. L = 0*1*

Ans. B

Sol. Definition of prefix property of L states that if x, y ∈ L, then x should not be a prefix of y, or vice-versa. option B satisfies the above property.

147. Which of the following is correct about Multilevel Queue (MLQ) scheduling and Multilevel Feedback Queue (MLFBQ) scheduling?

A. MLFBQ only suffer from starvation. B. MLQ and MLFBQ both suffer from starvation.

C. MLQ only suffer from starvation. D. None of these.

Ans. B

Sol. Option B is the correct answer as MLQ and MLFBQ both suffer from starvation.

148. A system has 9 identical resources and n process competing for them. Each process can request atmost 4 resources. Minimum possible value of N which lead to dead lock _____.

A. 2 B. 3

C. 4 D. 5

Ans. B

Sol. Resources = 9

Process = N

Requirement = Max = 4

[N – 1] × 3 + 4 = 9

3N – 3 + 4 = 9

3N = 8

N = 2

If value of N = 2 then there is no deadlock.

So minimum value of N is 3 which lead to deadlock.

149. Consider a system having m resources of the same type. These resources are shared by 3 processes X, Y and Z, which have peak demands of 4,5 and 7 respectively. For what maximum value of m deadlock can occur?

A. 12 B. 13

C. 14 D. 15

Ans. B

Sol. If all processes will acquire 1 less resources than their peak demand, then there can be deadlock as none of their demands will be fulfilled.

Hence ⇒ If we allocate 1 less resource to each process then we can have deadlock. So (4-1)+(5-1)+(7-1)=3+4+6=13

So, For 13 resources also there can be deadlock in system.

Another Approach: (Formula based) Sum of all the demands< no of resources(m)+no of processes(n)(For no deadlock)

Now here: m is what we have to find and n =3, Sum of all the demands of processes= 4+5+7=16.

So, m+n>16 => m+3>16 => m >13. Hence m =13 will lead to deadlock.

150. Which of the following is true about file allocation?

A. Linked File allocation supports direct or random access of file blocks

B. Indexed allocation does not support direct or random access of file blocks

C. Contiguous allocation supports direct or random access of file blocks

D. None of these

Ans. C

Sol. The table below shows the file allocation methods and their Access Sequence. Thus C is the correct answer.

Allocation	Access
Contiguous	Random, sequential
Linked	Sequential
Indexed	Random, sequential

****