

General Paper on Teaching and Research Aptitude

Previous Year Solved Paper (June 2019)

Time : 1 hours**Paper-I****Maximum Marks : 100**

Note : This paper contains fifty (50) objective type questions, each question carries two (2) marks. Attempt all the questions.

1. During research, while recording observations if an observer rates an individual based on the rating given in another aspect of the interaction, this is termed as the
 - (1) Evaluation effect
 - (2) Error of central tendency
 - (3) Halo effect
 - (4) Categorical effect
2. Inclusive education implies
 - (1) Ensuring learning outcome of every child to be the same
 - (2) Including the disabled in the main stream
 - (3) Provides compulsory education for children below 14 years
 - (4) Ensuring that no child is left behind in education
3. The study of 'why does stressful living result in heart attack' ? Can be classified as
 - (1) Descriptive research
 - (2) Explanatory research
 - (3) Correlational research
 - (4) Feasibility research
4. Listening is important for a teacher to
 - (1) address the requirement of the learner
 - (2) gain knowledge
 - (3) keep the learner in good humour
 - (4) evaluate the learner for the progress made
5. Reflective Practice implies use of one's
 - (1) Cognition
 - (2) Metacognition
 - (3) Metacognition on cognition
 - (4) Reinforcement of learning
6. Mailed questionnaire, observation, interview and collective questionnaire are instances of
 - (1) Secondary sources
 - (2) Personal sources
 - (3) Primary sources
 - (4) Tertiary sources
7. Peer group interaction in a classroom helps in
 - (1) Concept understanding
 - (2) Realization of One's misunderstanding
 - (3) Rapport Building
 - (4) Questioning

8. When the learning outcomes of students are ensured with employment of less resources and effort on the part of a teacher and more initiative for self-learning is evident, which of the following expression will describe the teacher most appropriately ?
- | | |
|----------------------------|--------------------------|
| (1) Teacher is successful | (2) Teacher is effective |
| (3) Teacher is intelligent | (4) Teacher is practical |
9. A hypothesis should be conceptually
- | | |
|-------------------------------------|-------------------------------------|
| (1) convoluted, complex and generic | (2) complex, tough and general |
| (3) simple, clear and specific | (4) obscure, complicated and simple |
10. The formulation of a research problem can be compared to
- | |
|---|
| (1) Laying the foundation of a building |
| (2) Building the walls of a home |
| (3) Polishing the doors of a building |
| (4) Constructing the ceiling of a house |

Direction (Q. 11 to 15)

A business will usually go through a clear set of stages that will make up its organisational life cycle. These stages include introduction, early growth, continuous growth, maturity and decline. The first stage, the introduction stage, is the start-up phase where a business decides what its core strengths and capabilities are and starts selling its product or service. At this early stage, the founder or founders will be a part of every aspect of the daily process of the business. The main goal at this stage is to take off to a good start and make a place in the market.

The next stage, the early growth phase, aims at increased sales and more development. The focus at this stage remains on the original product or service but the effort is to increase the market share and venture into related products or services. The main goal is to move the founder to a more managerial role so more time is spent on managing and building the business. At this stage, documents and policies need to be developed so any member of the organisation can see the business any time.

The third stage, the continuous growth stage, requires a systematic structure and more formal relationships among its participants. At this stage, the resource requirements of the business need careful handling. The focus is on the expansion of the business keeping in mind its core strength and capability. A formal organisational structure and a clear delegation plan are important at this stage.

At the fourth stage of maturity, a business often slows down as the level of innovative energy may have become weak and the formal structures may have become obstacles. A lot of care is required to prevent decline.

11. The slowing down of a business can happen if,
- | |
|--|
| (1) there is a decline in the market share |
| (2) the level of innovative energy weakens |
| (3) the managerial roles are not clear |
| (4) the level of investment declines |
12. The resource requirements of a business need careful handling at which stage ?
- | | |
|------------|------------|
| (1) Fourth | (2) First |
| (3) Third | (4) Second |

13. Venturing into related products and services does not mean that a business will
- (1) ignore the original product
 - (2) move the founder to a more managerial role
 - (3) delegate more responsibilities
 - (4) ignore the related products and services
14. When will a business create its place in the market ?
- (1) At maturity
 - (2) At introduction
 - (3) At early growth
 - (4) At late growth
15. The founder of a business does not move to a more managerial role at which stage ?
- (1) Early growth stage
 - (2) Maturity stage
 - (3) Decline stage
 - (4) Start up stage
16. Which of the following signifies non-verbal communication in an essential way ?
- (1) Instructions written on a question paper
 - (2) Learner attending an online class
 - (3) The dress code followed by an individual
 - (4) Yoga instructor teaching yoga poses to the pupils
17. If RED is coded as 6720, then how would GREEN be coded ?
- (1) 16717209
 - (2) 1677209
 - (3) 9207716
 - (4) 1677199
18. No Musicians are Japanese
All Barbers are Musicians
No barbers are Japanese
Identify the Middle Term in the above syllogism
- (1) Subject in the first premise and predicate in the second premise
 - (2) Predicate in the first premise and subject in the second premise
 - (3) Predicate in the both premises
 - (4) Subject in both the premises
19. Which of the following is a characteristic of modern mass media ?
- (1) Capital intensive
 - (2) Labour intensive
 - (3) Sustainable
 - (4) Developmental
20. Which of the following is a stage of intrapersonal communication ?
- (1) Phatic stage
 - (2) Intimate stage
 - (3) Personal stage
 - (4) Transcendental communication

21. A man travelled from the village to the railway station at the rate of 20 kmph and walked back at the rate of 5 kmph. If the whole journey took 5 hours, find the distance of the railway station from the village.
- (1) 10 km (2) 15 km
(3) 20 km (4) 40 km
22. Among the five friends, Vineet is taller than Monika, but not as tall as Ram. Jacob is taller than Dalip but shorter than Monika. Who is the tallest in their group ?
- (1) Ram (2) Monika
(3) Vineet (4) Jacob
23. Inductive argument proceeds from
- (1) Universal to Particular (2) Particular to Universal
(3) Universal to Universal (4) Particular to Particular
24. Semantic barrier of communication is implied when the
- (1) signal is lost before reaching the receiver
(2) message transmitted by the source is unclear
(3) receiver's attention is diverted
(4) receiver does not understand the meaning of the message
25. A trader mixes three varieties of refined oil costing Rs.100, Rs.40 and Rs.60 per litre in the ratio 2 : 4 : 3 in terms of litre, and sells the mixture at Rs.66 per litre. What percentage of profit does he make ?
- (1) 12% (2) 10%
(3) 9% (4) 8%
26. If the average of five numbers is – 20 and the sum of three of the numbers is 32, then what is the average of the other two numbers ?
- (1) – 66 (2) – 33
(3) – 34 (4) – 132
27. Consider the example given below :
Devadatta is growing fat.
He does not eat food during the day.
Therefore, He must be eating food during the night, other things being equal.
Identify the logic involved in the example provided above by choosing the correct answer from options given below :
- (1) Arthapatti (2) Anupalabdi
(3) Anumana (4) Sabda

28. If $0.75x = 0.02y$, then the value of $\left(\frac{y-x}{y+x}\right)$ is

- (1) $\frac{73}{75}$ (2) $\frac{75}{77}$
 (3) $\frac{73}{77}$ (4) $\frac{730}{75}$

29. Consider the argument provided below :

"Sound is permanent because it is a product like the jar".

Identify the fallacy involved in the above argument on the basis of Indian logic from the options given below.

- (1) Fallacy of contradictory reason (2) Fallacy of wrong assertion
 (3) Fallacy of irrelevant reason (4) Fallacy of trivial reason

30. **Assertion (A)** : Communication presupposes a shared, symbolic environment, a social relationship even among nonparticipants.

Reason (R) : It leads to social interaction, which in combination with other factors contributes to a sense of community.

Choose the correct option given below :

- (1) Both (A) and (R) are true and R is the correct explanation of A
 (2) Both (A) and (R) are true but R is not the correct explanation of A
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

Direction (Q. 31 to 35) : Consider the following table that shows the production of fertilizers by a company (in 10000 tonnes) during the year 2011 to 2018.

Answer the questions based on the data contained in the table :

Year :	2011	2012	2013	2014	2015	2016	2017	2018
Production of Fertilizers :	35	50	70	55	75	60	85	90

31. What was the percentage decline in the production of fertilizers from 2013 to 2014 ?

- (1) 20.4% (2) 21.4%
 (3) 22.6% (4) 24.2%

32. What was the approximate percentage increase in production of fertilizers in 2018 compared to that in 2011 ?

- (1) 157% (2) 165%
 (3) 177% (4) 182%

33. In how many of the given years was the production of fertilizers more than the average production of the given years ?

- (1) 2 (2) 3
 (3) 4 (4) 5

34. The average production of 2012 and 2013 was exactly equal to the average production of which of the following pairs of years ?
- | | |
|-------------------|-------------------|
| (1) 2011 and 2012 | (2) 2011 and 2017 |
| (3) 2012 and 2014 | (4) 2015 and 2016 |
35. In which year, the percentage increase in production as compared to the previous year was maximum ?
- | | |
|----------|----------|
| (1) 2012 | (2) 2013 |
| (3) 2015 | (4) 2018 |
36. Permafrost is defining characteristic of which biome ?
- | | |
|---------------|------------|
| (1) Taiga | (2) Tundra |
| (3) Grassland | (4) Desert |
37. The report of which of the following Education Commissions carries the sub-title 'Education for National Development' ?
- | |
|--|
| (1) Radhakrishnan Commission |
| (2) Mudaliar Commission |
| (3) Calcutta University Education Commission |
| (4) Kothari Commission |
38. In Audio and Video compression, the term RGB means
- | | |
|-----------------------|----------------------|
| (1) Red, Grey, Blue | (2) Red, Green, Blue |
| (3) Red, Green, Black | (4) Red, Grey, Black |
39. The mangroves exist in
- | | |
|------------------------|---------------------|
| (1) Fresh water system | (2) Temperate areas |
| (3) Semi-arid areas | (4) Saline waters |
40. Which of the following statements best explains the concept of sustainable development ?
- | |
|--|
| (1) Use of natural resources minimally |
| (2) Use of natural resources for our benefit |
| (3) Use of natural resources judiciously so that they are available for future generations |
| (4) Preserve our natural resources for our future generation |
41. Chemical oxygen demand in eutrophic water is
- | | |
|------------|-------------------|
| (1) Low | (2) High |
| (3) Medium | (4) Extremely low |
42. Match the following :
- | List-I | List-II |
|-----------------------|--------------------------|
| (a) First Generation | (i) Transistor |
| (b) Second Generation | (ii) VLSI microprocessor |
| (c) Third Generation | (iii) Vacuum tube |
| (d) Fourth Generation | (iv) Integrated circuit |

Codes :

	(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iii)	(i)	(ii)	(iv)
(4)	(i)	(iii)	(iv)	(ii)

43. Which of the following is not a/an web browser ?
(1) Internet Explorer (2) Mozilla Firefox
(3) Google chrome (4) Yahoo
44. One Tera Byte (TB) of memory is equal to
(1) 1024 KB (2) 1024×1024 KB
(3) $1024 \times 1024 \times 1024$ KB (4) $1024 \times 1024 \times 1024$ Bytes
45. The expansion of SANKALP is,
(1) Sanskrit Awareness and Knowledge Acquisition of Language Programme
(2) Skills Acquisition and Karatae Awareness for Livelihood Promotion
(3) Skills Acquisition and Knowledge Awareness for Livelihood Promotion
(4) Sanskrit Awareness and Knowledge Acquisition for Livelihood Promotion
46. In which year the modern Indian University got established ?
(1) 1957 (2) 1857
(3) 1947 (4) 1964
47. A/An _____ is a computer program that spreads by inserting copies of itself into other executable code or documents.
(1) Operating System (2) Computer Virus
(3) Firewall (4) Anti-virus
48. In which era given below, higher education in India got a set back ?
(1) British Era (2) Buddhist Era
(3) Mughal Era (4) Post-Independence Era
49. The target set by Indian government for generating power from wind energy by the year 2022 is
(1) 60 GW (2) 50 GW
(3) 40 GW (4) 15 GW
50. Which pollutant is the major source of marine pollution ?
(1) Agricultural run-off (2) Oil spill
(3) Industrial waste water (4) Sewage

ANSWER KEY

1	2	3	4	5	6	7	8	9	10
3	4	2	1	2	3	1	2	3	1
11	12	13	14	15	16	17	18	19	20
2	3	1	2	4	3	2	1	1	4
21	22	23	24	25	26	27	28	29	30
3	1	2	4	2	1	1	3	1	4
31	32	33	34	35	36	37	38	39	40
2	1	3	2	1	2	4	2	4	3
41	42	43	44	45	46	47	48	49	50
2	2	4	3	3	2	2	3	1	1 or 4



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Computer Science & Applications

Previous Year Solved Paper (June 2019)

Time : 2 hours

Paper-II

Maximum Marks : 200

Note : This paper contains hundred (100) objective type questions, each question carries two (2) marks. Attempt all the questions.

1. Following table has two attributes Employee_id and Manager_id, where Employee_id is a primary key and manager_id is a foreign key referencing Employee_id with on-delete cascade :

Employee_id	Manager_id
20	40
25	40
30	35
35	20
40	45
45	25

On deleting the tuple (20, 40), the set of other tuples that must be deleted to maintain the referential integrity of table is

- (1) (30, 35) only (2) (30, 35) and (35, 20) only
(3) (35, 20) only (4) (40, 45) and (25, 40) only

2. Consider the following grammar :

$$S \rightarrow XY$$

$$X \rightarrow YaY \mid a \text{ and } Y \rightarrow bbX$$

Which of the following statements is/are true about the above grammar ?

- (a) Strings produced by the grammar can have consecutive three a's.
(b) Every string produced by the grammar have alternate a and b.
(c) Every string produced by the grammar have at least two a's.
(d) Every string produced by the grammar have b's in multiple of 2.

- (1) (a) only (2) (b) and (c) only
(3) (d) only (4) (c) and (d) only

3. Consider the following C-code fragment running on a 32-bit x 86 machine :

```
typedef struct {
    union {
        unsigned char a;
        unsigned short b;
    } U;
    unsigned char c;
} S;

S B[10];
S*p=&B[4];
S*q=&B[5];
p → U.b = 0x1234;
/* structure S takes 32-bits */
```

If M is the value of $q - p$ and N is the value of $((int) \& (p \rightarrow c)) - ((int)p)$, then (M, N) is

- | | |
|------------|------------|
| (1) (1, 1) | (2) (3, 2) |
| (3) (1, 2) | (4) (4, 4) |

4. What percentage (%) of the IPv4, IP address space do all class C addresses consume ?

- | | |
|-----------|---------|
| (1) 12.5% | (2) 25% |
| (3) 37.5% | (4) 50% |

5. Match List-I with List-II :

- | List-I | List-II |
|---------------|----------------------------|
| (a) Disk | (i) Thread |
| (b) CPU | (iii) Signal |
| (c) Memory | (iii) File system |
| (d) Interrupt | (iv) Virtual address space |

Choose the correct option from those given below :

Codes :

- | | (a) | (b) | (c) | (d) |
|-----|-------|------|-------|-------|
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (iii) | (i) | (iv) | (ii) |
| (3) | (ii) | (i) | (iv) | (iii) |
| (4) | (ii) | (iv) | (iii) | (i) |

6. Which of the following statements is/are true ?

P : In a scripting language like JavaScript, types are typically associated with values, not variables.

Q : It is not possible to show images on a web page without the `<img>` tag of HTML.

Select the correct answer from the options given below :

- | | |
|------------------|---------------------|
| (1) P only | (2) Q only |
| (3) Both P and Q | (4) Neither P nor Q |

7. There are many sorting algorithms based on comparison. The running time of heapsort algorithm is $O(n \lg n)$. Like P, but unlike Q, heapsort sorts in place where (P, Q) is equal to

- | | |
|--------------------------------|--------------------------------|
| (1) Merge sort, Quick sort | (2) Quick sort, insertion sort |
| (3) Insertion sort, Quick sort | (4) Insertion sort, Merge sort |

8. Match List-I with List-II :

- | List-I | List-II |
|-----------------------|-----------------------------|
| (a) Greedy best-first | (i) Minimal cost (p) + h(p) |
| (b) Lowest cost-first | (ii) Minimal h(p) |
| (c) A* algorithm | (iii) Minimal cost (p) |

Choose the correct option from those given below :

Codes :

	(a)	(b)	(c)
(1)	(i)	(ii)	(iii)
(2)	(iii)	(ii)	(i)
(3)	(i)	(iii)	(ii)
(4)	(ii)	(iii)	(i)

9. Consider a raster system with resolution 640 by 480. What size is frame buffer (in bytes) for this system to store 12 bits per pixel ?

- | | |
|-------------------|-------------------|
| (1) 450 kilobytes | (2) 500 kilobytes |
| (3) 350 kilobytes | (4) 400 kilobytes |

10. Using the phong reflectance model, the strength of the specular highlight is determined by the angle between

- (1) The view vector and the normal vector
- (2) The light vector and the normal vector
- (3) The light vector and the reflected vector
- (4) The reflected vector and the view vector

11. K-mean clustering algorithm has clustered the given 8 observations into 3 clusters after 1st iteration as follows :

C1 : {(3, 3), (5, 5), (7, 7)}

C2 : {(0, 6), (6, 0), (3, 0)}

C3 : {(8, 8), (4, 4)}

What will be the Manhattan distance for observation (4, 4) from cluster centroid C1 in second iteration ?

- | | |
|-------|----------------|
| (1) 2 | (2) $\sqrt{2}$ |
| (3) 0 | (4) 18 |

12. You are designing a link layer protocol for a link with bandwidth of 1 Gbps (10^9 bits/second) over a fiber link with length of 800 km. Assume the speed of light in this medium is 200000 km/second. What is the propagation delay in this link ?

- | | |
|-------------------|-------------------|
| (1) 1 millisecond | (2) 2 millisecond |
| (3) 3 millisecond | (4) 4 millisecond |

13. In the context of software testing, which of the following statements is/are NOT correct ?

P : A minimal test set that achieves 100% path coverage will also achieve 100% statements coverage.

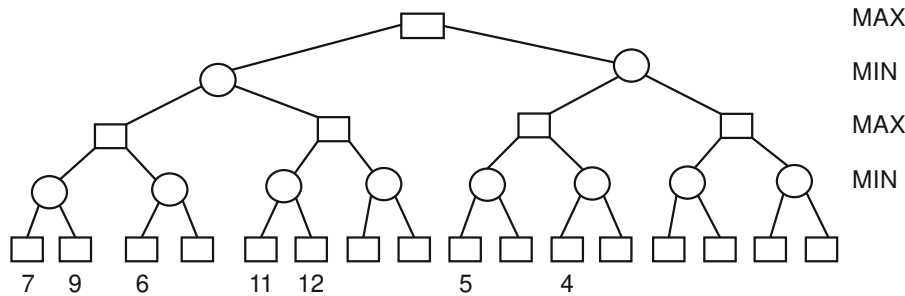
Q : A minimal test set that achieves 100% path coverage will generally detect more faults than one that achieves 100% statement coverage.

R : A minimal test set that achieves 100% statement coverage will generally detect more faults than one that achieves 100% branch coverage.

- | | |
|------------------|------------------|
| (1) R only | (2) Q only |
| (3) P and Q only | (4) Q and R only |

14. A Web application and its support environment has not been fully fortified against attack. Web engineers estimate that the likelihood of repelling an attack is only 30 percent. The application does not contain sensitive or controversial information, so the threat probability is 25 percent. What is the integrity of the web application ?
- (1) 0.625 (2) 0.725
(3) 0.775 (4) 0.825
15. For a magnetic disk with concentric circular tracks, the seek latency is not linearly proportional to the seek distance due to
- (1) Non-uniform distribution of requests
(2) Arm starting or stopping inertia
(3) Higher capacity of tracks on the periphery of the platter
(4) Use of unfair arm scheduling policies
16. The RSA encryption algorithm also works in reverse, that is, you can encrypt a message with the private key and decrypt it using the public key. This property is used in
- (1) Intrusion detection systems (2) Digital signatures
(3) Data compression (4) Certification
17. Consider the complexity class $CO - NP$ as the set of languages L such that $\bar{L} \in NP$, and the following two statements :
- $S_1 : P \subseteq CO - NP$
 $S_2 : \text{If } NP \neq CO - NP, \text{ then } P \neq NP$
- Which of the following is/are correct ?
- (1) Only S_1 (2) Only S_2
(3) Both S_1 and S_2 (4) Neither S_1 or S_2
18. What is the output of the following JAVA program ?
- ```
public class Good {
 private int m;
 public Good (int m) {this.m=m;}
 public Boolean equals (Good n) {return n.m==m;}
 public static void main (string args []) {
 Good m1 = new Good (22);
 Good m2 = new Good (22);
 Object s1 = new Good (22);
 Object s2 = new Good (22);
 System.out.println (m1.equals (m2));
 System.out.println (s1.equals (s2));
 System.out.println (m1.equals (s2));
 System.out.println (s1.equals (m2));
 }
}
```
- (1) True, True, False, False (2) True, False, True, False  
(3) True, True, False, True (4) True, False, False, False

19. Consider the game tree given below :



Here ○ and □ represents MIN and MAX nodes respectively.

The value of the root node of the game tree is

- (1) 4 (2) 7  
(3) 11 (4) 12

20. A fully connected network topology is a topology in which there is a direct link between all pairs of nodes. Given a fully connected network with  $n$  nodes, the number of direct links as a function of  $n$  can be expressed as

- (1)  $\frac{n(n+1)}{2}$  (2)  $\frac{(n+1)}{2}$   
(3)  $\frac{n}{2}$  (4)  $\frac{n(n-1)}{2}$

21. In relational database management, which of the following is/are property/ properties of candidate key ?

**P** : Uniqueness

**Q** : Irreducibility

- (1) P only (2) Q only  
(3) Both P and Q (4) Neither P nor Q

22. Consider the following statements regarding 2D transforms in computer graphics :

**S1** :  $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$  is a  $2 \times 2$  matrix that reflects (mirrors) only 2D point about the X-axis.

**S2** : A  $2 \times 2$  matrix which mirrors any 2D point about the X-axis, is a rotation matrix.

What can you say about the statements S1 and S2 ?

- (1) Both S1 and S2 are true (2) Only S1 is true  
(3) Only S2 is true (4) Both S1 and S2 are false

23. Which type of addressing mode, less number of memory references are required ?

- (1) Immediate (2) Implied  
(3) Register (4) Indexed

24. With respect to relational algebra, which of the following operations are included from mathematical set theory ?
- |                       |                  |
|-----------------------|------------------|
| (a) Join              | (b) Intersection |
| (c) Cartesian product | (d) Project      |
| (1) (a) and (d)       | (2) (b) and (c)  |
| (3) (c) and (d)       | (4) (b) and (d)  |
25. Consider three CPU intensive processes, which require 10, 20 and 30 units of time and arrive at times 0, 2 and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.
- |       |       |
|-------|-------|
| (1) 4 | (2) 2 |
| (3) 3 | (4) 1 |
26. How many different Boolean functions of degree  $n$  are there ?
- |                   |               |
|-------------------|---------------|
| (1) $2^{2^n}$     | (2) $(2^2)^n$ |
| (3) $2^{2^n} - 1$ | (4) $2^n$     |
27. Consider the following properties with respect to a flow network  $G = (V, E)$  in which a flow is a real-valued function  $f : V \times V \rightarrow \mathbb{R}$  :
- $P_1$  : For all  $u, v \in V$ ,  $f(u, v) = -f(v, u)$
- $P_2$  :  $\sum_{v \in V} f(u, v) = 0$  for all  $u \in V$
- Which one of the following is/are correct ?
- |                          |                             |
|--------------------------|-----------------------------|
| (1) Only $P_1$           | (2) Only $P_2$              |
| (3) Both $P_1$ and $P_2$ | (4) Neither $P_1$ nor $P_2$ |
28. Which of the following key constraints is required for functioning of foreign key in the context of relational databases ?
- |                   |                 |
|-------------------|-----------------|
| (1) Unique key    | (2) Primary key |
| (3) Candidate key | (4) Check key   |
29. What will be the number of states when a MOD-2 counter is followed by a MOD-5 counter ?
- |        |        |
|--------|--------|
| (1) 5  | (2) 10 |
| (3) 15 | (4) 20 |
30. Which of the following UNIX/Linux pipes will count the number of lines in all the files having `.c` and `.h` as their extension in the current working directory ?
- |                                  |                                     |
|----------------------------------|-------------------------------------|
| (1) <code>cat*.ch wc -l</code>   | (2) <code>cat*.[c - h] wc -l</code> |
| (3) <code>cat*.[ch] ls -l</code> | (4) <code>cat*.[ch] wc -l</code>    |
31. Which of the following is best running time to sort  $n$  integers in the range 0 to  $n^2 - 1$  ?
- |                  |              |
|------------------|--------------|
| (1) $O(\lg n)$   | (2) $O(n)$   |
| (3) $O(n \lg n)$ | (4) $O(n^2)$ |

32. Consider the following pseudo-code fragment in which an invariant for the loop is " $m \cdot x^k = p^n$  and  $k \geq 0$ " (here,  $p$  and  $n$  are integer variables that have been initialized) :

```
/* Pre-conditions : $p \geq 1 \wedge n \geq 0$ */
/* Assume that overflow never occurs */
int x=p; int k=n; int m=1;
while (k > 0) {
 if (k is odd) then m=m*x;
 x=x*x;
 k = $\lfloor k / 2 \rfloor$; /*floor(k/2)*/
}
```

Which of the following must be true at the end of the while loop ?

- |               |               |
|---------------|---------------|
| (1) $x = p^n$ | (2) $m = p^n$ |
| (3) $p = x^n$ | (4) $p = m^n$ |

33. Consider the following C++ function f() :

```
unsigned int f (unsigned int n) {
 unsigned int b=0;
 while (n) {
 b += n & 1;
 n >>= 1;
 }
 return b;
}
```

The function f() returns the int that represents the \_\_\_\_P\_\_\_\_ in the binary representation of positive integer n, where P is

- |                               |                    |
|-------------------------------|--------------------|
| (1) number of 0's             | (2) number of bits |
| (3) number of consecutive 1's | (4) number of 1's  |

34. Suppose that the register A and the register K have the bit configuration. Only the three leftmost bits of A are compared with memory words because K has 1's in these positions. Because of its organization, this type of memory is uniquely suited to parallel searches by data association. This type of memory is known as

- |                                |                      |
|--------------------------------|----------------------|
| (1) RAM                        | (2) ROM              |
| (3) Content addressable memory | (4) Secondary Memory |

35. The fault can be easily diagnosed in the micro-program control unit using diagnostic tools by maintaining the contents of

- |                         |                                   |
|-------------------------|-----------------------------------|
| (1) Flags and counters  | (2) Registers and counters        |
| (3) Flags and registers | (4) Flags, registers and counters |

36. How many ways are there to place 8 indistinguishable balls into four distinguishable bins ?

- |               |               |
|---------------|---------------|
| (1) 70        | (2) 165       |
| (3) ${}^8C_4$ | (4) ${}^8P_4$ |

37. Consider an LPP given as

$$\text{Max } Z = 2x_1 - x_2 + 2x_3$$

Subject to the constraints

$$2x_1 + x_2 \leq 10$$

$$x_1 + 2x_2 - 2x_3 \leq 20$$

$$x_1 + 2x_3 \leq 5$$

$$x_1, x_2, x_3 \geq 0$$

What shall be the solution of the LPP after applying first iteration of the Simplex Method ?

- (1)  $x_1 = \frac{5}{2}, x_2 = 0, x_3 = 0, Z = 5$       (2)  $x_1 = 0, x_2 = 0, x_3 = \frac{5}{2}, Z = 5$   
 (3)  $x_1 = 0, x_2 = \frac{5}{2}, x_3 = 0, Z = -\frac{5}{2}$       (4)  $x_1 = 0, x_2 = 0, x_3 = 10, Z = 20$

38. Match List-I with List-II :

where  $L_1$  : Regular language

$L_2$  : Context-free language

$L_3$  : Recursive language

$L_4$  : Recursively enumerable language

**List-I**

(a)  $\overline{L_3} \cup L_4$

(b)  $\overline{L_2} \cup L_3$

(c)  $L_1^* \cap L_2$

**List-II**

(i) Context-free language

(ii) Recursively enumerable language

(iii) Recursive language

Choose the correct option from those given below :

**Codes :**

- |     | (a)   | (b)   | (c)   |
|-----|-------|-------|-------|
| (1) | (ii)  | (i)   | (iii) |
| (2) | (ii)  | (iii) | (i)   |
| (3) | (iii) | (i)   | (ii)  |
| (4) | (i)   | (ii)  | (iii) |

39. For a statement A language  $L \subseteq \Sigma^*$  is recursive if there exists some turing machine M.

Which of the following conditions is satisfied for any string  $\omega$  ?

- (1) If  $\omega \in L$ , then M accepts  $\omega$  and M will not halt  
 (2) If  $\omega \notin L$ , then M accepts  $\omega$  and M will halt by reaching at final state  
 (3) If  $\omega \notin L$ , then M halts without reaching to acceptable state  
 (4) If  $\omega \in L$ , then M halts without reaching to an acceptable state

40. Reinforcement learning can be formalized in terms of \_\_\_\_\_ in which the agent initially only knows the set of possible \_\_\_\_\_ and the set of possible actions.

- (1) Markov decision processes, objects  
 (2) Hidden states, objects  
 (3) Markov decision processes, states  
 (4) Objects, states

41. In relational databases, if relation R is in BCNF, then which of the following is true about relation R ?
- (1) R is in 4NF (2) R is not in 1NF  
(3) R is in 2NF and not in 3NF (4) R is in 2NF and 3NF

42. Which of the following features is supported in the relational database model ?
- (1) Complex data-types (2) Multivalued attributes  
(3) Associations with multiplicities (4) Generalization relationships

43. Consider the Euler's phi function given by

$$\phi(n) = n \prod_{p|n} \left(1 - \frac{1}{p}\right)$$

where p runs over all the primes dividing n. What is the value of  $\phi(45)$  ?

- (1) 3 (2) 12  
(3) 6 (4) 24
44. Consider double hashing of the form  
 $h(k, i) = (h_1(k) + ih_2(k)) \bmod m$   
 where  $h_1(k) = k \bmod m$   
 $h_2(k) = 1 + (k \bmod n)$   
 where  $n = m - 1$  and  $m = 701$   
 For  $k = 123456$ , what is the difference between first and second probes in terms of slots ?
- (1) 255 (2) 256  
(3) 257 (4) 258
45. The minimum number of page frames that must be allocated to a running process in a virtual memory environment is determined by
- (1) Page size (2) Physical size of memory  
(3) The instruction set architecture (4) Number of processes in memory

46. Find the zero-one matrix of the transitive closure of the relation given by the matrix A :

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

(1)  $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$

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

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

(4)  $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

47. For which values of  $m$  and  $n$  does the complete bipartite graph  $K_{m,n}$  have a Hamilton circuit ?
- (1)  $m \neq n, m, n \geq 2$  (2)  $m \neq n, m, n \geq 3$   
 (3)  $m = n, m, n \geq 2$  (4)  $m = n, m, n \geq 3$

48. A computer has six tape drives with  $n$  processes competing for them. Each process may need two drives. What is the maximum value of  $n$  for the system to be deadlock free ?
- (1) 5 (2) 4  
 (3) 3 (4) 6

49. How can the decision algorithm be constructed for deciding whether context-free language  $L$  is finite ?
- (a) By constructing redundant CFG  $G$  in CNF generating language  $\bar{L}$   
 (b) By constructing non-redundant CFG  $G$  in CNF generating language  $L$   
 (c) By constructing non-redundant CFG  $G$  in CNF generating language  $L - \{\wedge\}$  ( $\wedge$  stands for null)

Which of the following is correct ?

- (1) (a) only (2) (b) only  
 (3) (c) only (4) None of (a), (b) and (c)

50. The value of the derivative of Sigmoid function given by

$$f(x) = \frac{1}{1 + e^{-2x}}$$

at  $x = 0$  is

- (1) 0 (2)  $\frac{1}{2}$   
 (3)  $\frac{1}{4}$  (4)  $\infty$

51. Which of the following has same expressive power with regard to relational query language ?
- (a) Relational algebra and domain relational calculus  
 (b) Relational algebra and tuples relational calculus  
 (c) Relational algebra and domain relational calculus restricted to safe expression  
 (d) Relational algebra and tuples relational calculus restricted to safe expression
- (1) (a) and (b) only (2) (c) and (d) only  
 (3) (a) and (c) only (4) (b) and (d) only

52. Match List-I with List-II

**List-I**

- (a)  $p \rightarrow q$   
 (b)  $p \vee q$   
 (c)  $p \wedge q$   
 (d)  $\neg(p \rightarrow q)$

**List-II**

- (i)  $\neg(q \rightarrow \neg p)$   
 (ii)  $p \wedge \neg q$   
 (iii)  $\neg p \rightarrow q$   
 (iv)  $\neg p \vee q$

Choose the correct option from those given below :

**Codes :**

|     | (a)  | (b)   | (c)   | (d)  |
|-----|------|-------|-------|------|
| (1) | (ii) | (iii) | (i)   | (iv) |
| (2) | (ii) | (i)   | (iii) | (iv) |
| (3) | (iv) | (i)   | (iii) | (ii) |
| (4) | (iv) | (iii) | (i)   | (ii) |

53. Which of the following are the primary objectives of risk monitoring in software project tracking?

**P :** To assess whether predicted risks do, in fact, occur

**Q :** To ensure that risk aversion steps defined for the risk are being properly applied

**R :** To collect information that can be used for future risk analysis

- |                  |                    |
|------------------|--------------------|
| (1) Only P and Q | (2) Only P and R   |
| (3) Only Q and R | (4) All of P, Q, R |

54. Match List-I with List-II :

| List-I                             | List-II             |
|------------------------------------|---------------------|
| (a) Prim's algorithm               | (i) $O(V^3 \log V)$ |
| (b) Dijkstra's algorithm           | (ii) $O(VE^2)$      |
| (c) Faster all-pairs shortest path | (iii) $O(E \lg V)$  |
| (d) Edmonds-Karp algorithm         | (iv) $O(V^2)$       |

Choose the correct option from those given below :

**Codes :**

|     | (a)   | (b)  | (c)  | (d)   |
|-----|-------|------|------|-------|
| (1) | (ii)  | (iv) | (i)  | (iii) |
| (2) | (iii) | (iv) | (i)  | (ii)  |
| (3) | (ii)  | (i)  | (iv) | (iii) |
| (4) | (iii) | (i)  | (iv) | (ii)  |

55. Suppose that a computer program takes 100 seconds of execution time on a computer with multiplication operation responsible for 80 seconds of this time. How much do you have to improve the speed of multiplication operation if you are asked to execute this program four times faster ?

- |                     |                     |
|---------------------|---------------------|
| (1) 14 times faster | (2) 15 times faster |
| (3) 16 times faster | (4) 17 times faster |

56. In the TCP/IP model, encryption and decryption are function of \_\_\_\_\_ layer.

- |               |                 |
|---------------|-----------------|
| (1) Data link | (2) Network     |
| (3) Transport | (4) Application |

57. How many cards must be selected from a standard deck of 52 cards to guarantee that at least three hearts are present among them ?

- |        |        |
|--------|--------|
| (1) 9  | (2) 13 |
| (3) 17 | (4) 42 |

58. Which data structure is used by the compiler for managing variables and their attributes ?
- (1) Binary tree
  - (2) Link list
  - (3) Symbol table
  - (4) Parse table
59. Which of the following statements is/are true ?
- P** : In software engineering, defects that are discovered earlier are more expensive to fix.
- Q** : A software design is said to be a good design, if the components are strongly cohesive and weakly coupled.
- Select the correct answer from the options given below :
- (1) P only
  - (2) Q only
  - (3) P and Q
  - (4) Neither P nor Q
60. Consider the following :
- (a) Evolution
  - (b) Selection
  - (c) Reproduction
  - (d) Mutation
- Which of the following are found in genetic algorithms ?
- (1) (b), (c) and (d) only
  - (2) (b) and (d) only
  - (3) (a), (b), (c) and (d)
  - (4) (a), (b) and (d) only
61. Consider the poset  $(\{3, 5, 9, 15, 24, 45\}, |)$ .
- Which of the following is correct for the given poset ?
- (1) There exists a greatest element and a least element
  - (2) There exists a greatest element but not a least element
  - (3) There exists a least element but not a greatest element
  - (4) There does not exist a greatest element and a least element
62. How many states are there in a minimum state automata equivalent to regular expression given below ?
- Regular expression is  $a * b(a + b)$
- (1) 1
  - (2) 2
  - (3) 3
  - (4) 4
63. Match List-I with List-II
- | <b>List-I</b><br><b>(Software Process Models)</b> | <b>List-II</b><br><b>(Software Systems)</b>                                                                         |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| (a) Waterfall model                               | (i) e-business software that starts with only the basic functionalities and then moves on to more advanced features |
| (b) Incremental development                       | (ii) An inventory control system for a supermarket to be developed within three months                              |
| (c) Prototyping                                   | (iii) A virtual reality system for simulating vehicle navigation in a highway                                       |
| (d) RAD                                           | (iv) Automate the manual system for student record maintenance in a school                                          |

Choose the correct option from those given below :

**Codes :**

- |     | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
|-----|------------|------------|------------|------------|
| (1) | (ii)       | (iv)       | (i)        | (iii)      |
| (2) | (i)        | (iii)      | (iv)       | (ii)       |
| (3) | (iii)      | (ii)       | (iv)       | (i)        |
| (4) | (iv)       | (i)        | (iii)      | (ii)       |

**64.** Consider the following two statements with respect to IPv4 in computer networking :

**P :** The loopback (IP) address is a member of class B network.

**Q :** The loopback (IP) address is used to send a packet from host to itself.

What can you say about the statements P and Q ?

- |                     |                      |
|---------------------|----------------------|
| (1) P–True, Q–False | (2) P–False, Q–True  |
| (3) P–True; Q–True  | (4) P–False; Q–False |

**65.** Which of the following terms best describes Git ?

- (1) Issue Tracking System
- (2) Integrated Development Environment
- (3) Distributed Version Control System
- (4) Web-based Repository Hosting Service

**66.** Hadoop (a big data tool) works with number of related tools. Choose from the following, the common tools included into Hadoop :

- (1) MySQL, Google API and Map reduce
- (2) Map reduce, Scala and Hummer
- (3) Map reduce, H Base and Hive
- (4) Map reduce, Hummer and Heron

**67.** Shift-reduce parser consists of

- |                  |           |
|------------------|-----------|
| (a) Input buffer | (b) Stack |
| (c) Parse table  |           |

Choose the correct option from those given below :

- |                      |                      |
|----------------------|----------------------|
| (1) (a) and (b) only | (2) (a) and (c) only |
| (3) (c) only         | (4) (a), (b) and (c) |

**68.** How many address lines and data lines are required to provide a memory capacity of  $16K \times 16$ ?

- |            |            |
|------------|------------|
| (1) 10, 4  | (2) 16, 16 |
| (3) 14, 16 | (4) 4, 16  |

**69.** At a particular time of computation, the value of a counting semaphore is 7. Then 20 P (wait) operations and 15 V (signal) operations are completed on this semaphore. What is the resulting value of the semaphore ?

- |        |        |
|--------|--------|
| (1) 28 | (2) 12 |
| (3) 2  | (4) 42 |

70. Suppose that a connected planar graph has six vertices, each of degree four. Into how many regions is the plane divided by a planar representation of this graph ?
- (1) 6 (2) 8  
(3) 12 (4) 20
71. Which of the following statements are DML statements ?
- (a) Update [tablename]  
Set [columnname] = VALUE  
(b) Delete [tablename]  
(c) Select \* from [tablename]
- (1) (a) and (b) (2) (a) and (d)  
(3) (a), (b) and (c) (4) (b) and (c)
72. Which of the following statements is/are true with regard to various layers in the Internet stack?
- P :** At the link layer, a packet of transmitted information is called a frame.  
**Q :** At the network layer, a packet of transmitted information is called a segment
- (1) P only (2) Q only  
(3) P and Q (4) Neither P and Q
73. Which of the following is application of depth-first search ?
- (1) Only topological sort  
(2) Only strongly connected components  
(3) Both topological sort and strongly connected components  
(4) Neither topological sort nor strongly connected components
74. Software reuse is
- (1) The process of analysing software with the objective of recovering its design and specification  
(2) The process of using existing software artifacts and knowledge to build new software  
(3) Concerned with reimplementing legacy system to make them more maintainable  
(4) The process of analysing software to create a representation of a higher level of abstraction and breaking software down into its parts to see how it works
75. Consider the following methods :
- $M_1$  : Mean of maximum  
 $M_2$  : Centre of area  
 $M_3$  : Height method
- Which of the following is/are defuzzification method (s) ?
- (1) Only  $M_2$  (2) Only  $M_1$  and  $M_2$   
(3) Only  $M_2$  and  $M_3$  (4)  $M_1$ ,  $M_2$  and  $M_3$

76. Which of the following problems is/are decidable problem(s) (recursively enumerable) on turing machine M ?
- G is a CFG with  $L(G) = \phi$
  - There exist two TMs  $M_1$  and  $M_2$  such that  $L(M) \subseteq \{L(M_1) \cup L(M_2)\}$  = language of all TMs
  - M is a TM that accepts  $\omega$  using at most  $2^{|\omega|}$  cells of tape
- (a) and (b) only
  - (a) only
  - (a), (b) and (c)
  - (c) only
77. Let  $A_{\alpha_0}$  denotes the  $\alpha$ -cut of a fuzzy set A at  $\alpha_0$ . If  $\alpha_1 < \alpha_2$ , then
- $A_{\alpha_1} \supseteq A_{\alpha_2}$
  - $A_{\alpha_1} \supset A_{\alpha_2}$
  - $A_{\alpha_1} \subseteq A_{\alpha_2}$
  - $A_{\alpha_1} \subset A_{\alpha_2}$
78. Which of the following is an example of unsupervised neural network ?
- Back-propagation network
  - Hebb network
  - Associative memory network
  - Self-organizing feature map
79. How many bit strings of length ten either start with a 1 bit or end with two bits 00 ?
- 320
  - 480
  - 640
  - 768
80. Consider the following statements :
- $S_1$  : For any integer  $n > 1$ ,  $a^{\phi(n)} \equiv 1 \pmod{n}$  for all  $a \in Z_n^*$ , where  $\phi(n)$  is Euler's phi function.
- $S_2$  : If p is prime, then  $a^p \equiv 1 \pmod{p}$  for all  $n \in Z_p^*$ .
- Which one of the following is/are correct ?
- Only  $S_1$
  - Only  $S_2$
  - Both  $S_1$  and  $S_2$
  - Neither  $S_1$  nor  $S_2$
81. Consider the equation  $(146)_b + (313)_{b-2} = (246)_8$ . Which of the following is the value of b ?
- 8
  - 7
  - 10
  - 16
82. Which of the following is principal conjunctive normal form for  $[(p \vee q) \wedge \neg q \rightarrow \neg q]$  ?
- $p \vee \neg q$
  - $p \vee q$
  - $\neg p \vee q$
  - $\neg p \vee \neg q$
83. The M components in MVC are responsible for
- User interface
  - Security of the system
  - Business logic and domain objects
  - Translating between user interface actions/events and operations on the domain objects

84. Which of the following are NOT shared by the threads of the same process ?
- |                   |                      |
|-------------------|----------------------|
| (a) Stack         | (b) Registers        |
| (c) Address space | (d) Message queue    |
| (1) (a) and (d)   | (2) (b) and (c)      |
| (3) (a) and (b)   | (4) (a), (b) and (c) |
85. What is the name of the protocol that allows a client to send a broadcast message with its MAC address and receive an IP address in reply ?
- |          |          |
|----------|----------|
| (1) ARP  | (2) DNS  |
| (3) RARP | (4) ICMP |
86. Consider a disk system with 100 cylinders. The requests to access the cylinders occur in the following sequence :
- 4, 34, 10, 7, 19, 73, 2, 15, 6, 20
- Assuming that the head is currently at cylinder 50, what is the time taken to satisfy all requests if it takes 1ms to move from the cylinder to adjacent one and the shortest seek time first policy is used ?
- |            |            |
|------------|------------|
| (1) 357 ms | (2) 238 ms |
| (3) 276 ms | (4) 119 ms |
87. A fuzzy conjunction operator denoted as  $t(x, y)$  and a fuzzy disjunction operator denoted as  $s(x, y)$  from a dual pair if they satisfy the condition :
- |                                     |                                 |
|-------------------------------------|---------------------------------|
| (1) $t(x, y) = 1 - s(x, y)$         | (2) $t(x, y) = s(1 - x, 1 - y)$ |
| (3) $t(x, y) = 1 - s(1 - x, 1 - y)$ | (4) $t(x, y) = s(1 + x, 1 + y)$ |
88. Consider the following steps :
- $S_1$  : Characterize the structure of an optimal solution
- $S_2$  : Compute the value of an optimal solution in bottom-up fashion
- Which of the step(s) is/are common to both dynamic programming and greedy algorithms ?
- |                          |                             |
|--------------------------|-----------------------------|
| (1) Only $S_1$           | (2) Only $S_2$              |
| (3) Both $S_1$ and $S_2$ | (4) Neither $S_1$ nor $S_2$ |
89. You need 500 subnets, each with about 100 usable host address per subnet. What network mask will you assign using a class B network address ?
- |                     |                     |
|---------------------|---------------------|
| (1) 255·255·255·252 | (2) 255·255·255·128 |
| (3) 255·255·255·0   | (4) 255·255·254·0   |
90. In the context of 3D computer graphics, which of the following statements is/are true ?
- P** : Orthographic transformations keep parallel lines parallel.
- Q** : Orthographic transformations are affine transformations.
- Select the correct answer from the options given below :
- |                  |                     |
|------------------|---------------------|
| (1) Both P and Q | (2) Neither P nor Q |
| (3) Only P       | (4) Only Q          |

- Select the correct answer from the options given below :

98. The parallel bus arbitration technique uses an external priority encoder and decoder. Suppose, a parallel arbiter has 5 bus arbiters. What will be the size of priority encoder and decoder respectively ?
- (1)  $4 \times 2, 2 \times 4$  (2)  $2 \times 4, 4 \times 2$   
(3)  $3 \times 8, 8 \times 3$  (4)  $8 \times 3, 3 \times 8$
99. Software products need adaptive maintenance for which of the following reasons ?
- (1) To rectify bugs observed while the system is in use  
(2) When the customers need the product to run on new platforms  
(3) To support the new features that users want it to support  
(4) To overcome wear and tear caused by the repeated use of the software
100. A processor can support a maximum memory of 4 GB where memory is word addressable and a word is 2 bytes. What will be the size of the address bus of the processor ?
- (1) At least 28 bits (2) At least 2 bytes  
(3) At least 31 bits (4) Minimum 4 bytes

### ANSWER KEY

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  |
| 2  | 4  | 3  | 1  | 2  | 1  | 4  | 4  | 1  | 4   |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20  |
| 1  | 4  | 1  | 4  | 2  | 2  | 3  |    | 2  | 4   |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30  |
| 3  | 2  | *  | 2  | 2  | 1  | 1  | 2  | 2  | 4   |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40  |
| 2  | 2  | 4  | 3  | 4  | 2  | 2  | 2  | 3  | 3   |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50  |
| 4  | 3  | 4  | 3  | 3  | 1  | 3  | 1  | 3  | 2   |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60  |
| 2  | 4  | 4  | 2  | 3  | 4  | 4  | 3  | 2  | 3   |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70  |
| 4  | 3  | 4  | 2  | 3  | 3  | 4  | 3  | 3  | 2   |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80  |
| 3  | 1  | 3  | 2  | 4  | 3  | 1  | 4  | 3  | 1   |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90  |
| 2  | 1  | 3  | 3  | 3  | 4  | 3  | 1  | 2  | 1   |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 1  | 1  | 2  | 2  | 3  | 1  | 4  | 4  | 2  | 3   |

# General Paper on Teaching and Research Aptitude

## Previous Year Solved Paper (Dec. 2019)

Time : 1 hours

Paper-I

Maximum Marks : 100

**Note :** This paper contains fifty (50) objective type questions, each question carries two (2) marks. All questions are compulsory.

- Which of the following will help overcome communication barriers?
  - Focused listening
  - Neglecting semantic noise
  - Top-down command structure
  - Use of clichéd idioms
- A circle has the same area as that of a square of diagonal of length 11.0 cm. What is the diameter of the circle?
  - 8.7 cm
  - 17.4 cm
  - 7.8 cm
  - 15.6 cm
- Effective educational communication is
  - Non-reciprocal
  - Repetitive
  - Continuous
  - Coercive
- A shopkeeper sells a refrigerators for Rs. 22,000.00 and makes a profit of 10%. If he desires to make a profit of 18%, what should be his selling price?
  - Rs. 23, 600
  - Rs. 39,600
  - Rs. 36,000
  - Rs. 24600
- Determine the term 'X' in the following series  
2, 9, 20, 35, 54, 77, 'X'
  - 104
  - 102
  - 89
  - 110
- A student obtains overall 78% marks in his examination consisting of Physics, Chemistry, Mathematics, Computer Science and General English. Marks obtained in each subject and the maximum marks are indicated in the following table

|                       | Physics       | Chemistry     | Mathematics   | Computer Science | General English |
|-----------------------|---------------|---------------|---------------|------------------|-----------------|
| <b>Subject</b>        | 200 Max Marks | 100 Max Marks | 200 Max Marks | 200 Max Marks    | 100 Max Marks   |
| <b>Marks Obtained</b> | 155           | 80            | 165           | 140              | X               |

The marks (X) obtained by the student in General English would be

- 68
- 74
- 84
- 90

7. Successful educational communication is dependent upon the skills of
- Understanding the negative characteristics of the audience
  - Verbal communication and body language
  - Estimating time for audience impact
  - Analyzing the audience needs
- Choose the correct answer from the options given below
- (1) (a) and (b) only
  - (2) (b) and (c) only
  - (3) (c) and (d) only
  - (4) (b) and (d) only
8. A college teacher presents a research paper in a seminar. The research paper cites references which are pretty old. This situation will be described as the case of
- (1) Technical lapse
  - (2) Ethical lapse
  - (3) Academic ignorance
  - (4) Inability of updating research source
9. Consider the following with reference to the Indian School of Logic
- (a) It is related to form of the argument only
  - (b) It is related to the content of the argument only
  - (c) It is related to perceptual knowledge alone
  - (d) It is related to presenting analogies alone
- Choose the correct answer from the options given below
- (1) (a) only
  - (2) (b) only
  - (3) Both (a) and (b)
  - (4) Both (c) and (d)
10. The converse of "All cats are mammals" is
- (1) Some mammals are not cats
  - (2) No mammals are cats
  - (3) Some mammals are cats
  - (4) All mammals are cats
11. At the stage of data analysis, in which quantitative techniques have been used by a researcher, the evidence warrants the rejection of Null Hypothesis ( $H_0$ ). Which of the following decisions of the researcher will be deemed appropriate?
- (1) Rejecting the ( $H_0$ ) and also the substantive research hypothesis
  - (2) Rejecting the ( $H_0$ ) and accepting the substantive research hypothesis
  - (3) Rejecting the ( $H_0$ ) without taking any decision on the substantive research hypothesis
  - (4) Accepting the ( $H_0$ ) and rejecting the substantive research hypothesis
12. Which of the following is not a necessary step when you present an argument based on inference before the others according to the Classical Indian School of Logic?
- (1) Nigamana
  - (2) Upamana
  - (3) Upanaya
  - (4) Udaharana
13. Which of the following theories can be applied to classroom communication?
- (1) Theory of Social Constructivism
  - (2) Audience Marginalization Theory
  - (3) Ritualistic Theory
  - (4) Theory of Hegemony

14. Which of the following factors have been labelled as 'social competence' in influencing learning?
- (a) Socio-economic status
  - (b) Motivation
  - (c) Intelligence - general and specific
  - (d) Emotional well-being
  - (e) Inability to translate thoughts into action
- Choose the correct answer from the options given below
- (1) (a), (b) and (c) only
  - (2) (b), (c) and (d) only
  - (3) (a), (b) and (d) only
  - (4) (c), (d) and (e) only
15. The main purpose of using ICT for classroom teaching is to
- (1) Make the classroom instructions interesting
  - (2) Divert students' attention in the class
  - (3) Keep students engaged in the class
  - (4) Optimize learning outcomes of teaching
16. Which of the following will be considered key teaching behaviour belonging to the category of effectiveness?
- (a) Making ideas clear to learners who may be at different level of understanding
  - (b) Showing enthusiasm and animation through variation in eye contact, voice and gestures
  - (c) Using student ideas by acknowledging and summarizing
  - (d) Probing through general questions and shifting a discussion to some higher thought level
  - (e) Using meaningful verbal praise to get and keep students actively participating in the learning process
- Choose the correct answer from the options given below
- (1) (a), (b) and (c) only
  - (2) (a), (b) and (e) only
  - (3) (b), (c) and (d) only
  - (4) (c), (d) and (e) only
17. In the statement "No dogs are reptiles", which terms are distributed?
- (1) Only subject term
  - (2) Only predicate term
  - (3) Both subject and predicate terms
  - (4) Neither subject nor predicate term
18. "Mr X lives in a slum and is unemployed. Therefore, Mr X deserves to be a minister." Which kind of fallacy is committed in this argument?
- (1) Fallacy of Composition
  - (2) Ad misericordium
  - (3) Fallacy of Division
  - (4) Fallacy of Accident
19. If data has been recorded using technical media, which among the following is a necessary step on the way to its interpretation?
- (1) Transcription
  - (2) Structural Equation Modelling
  - (3) Sequential Analysis
  - (4) Sampling

20. The two cities P and Q are 360 km apart from each other. A car goes from P to Q with a speed of 40 km/hr and returns to P with a speed of 60 km/hr. What is the average speed of the car?
- (1) 45 km/hr (2) 48 km/hr  
(3) 50 km/hr (4) 55 km/hr

21. Identify the sequence which correctly indicates the order for ensuring teaching-learning activities in a constructivist approach
- (1) Explore, Explain, Engage, Extend and Evaluate  
(2) Evaluate, Extend, Engage, Explain and Explore  
(3) Explain, Engage, Explore, Evaluate and Extend  
(4) Engage, Explore, Explain, Evaluate and Extend

22. In an intervention based action research process, which of the following is the usually recommended sequence?
- (1) Plan, Act, Observe and Reflect (2) Observe, Plan, Act and Reflect  
(3) Reflect, Plan, Act and Observe (4) Observe, Act, Reflect and Plan

23. Match Set I with Set II

| Set I                               | Set II                              |
|-------------------------------------|-------------------------------------|
| (Research Tools)                    | (Measurement Scale)                 |
| (a) Questionnaire and Interview     | (i) Ratio scale of measurement      |
| (b) Intelligence and Aptitude Tests | (ii) Ordinal Scale of measurement   |
| (c) Attitude and Value Tests        | (iii) Interval Scale of measurement |
| (d) Speed and Frequency Tests       | (iv) Nominal Scale of measurement   |

Choose the correct answer from the options given below

- (1) (a) - (i); (b) - (ii); (c) - (iii); (d) - (iv)  
(2) (a) - (iii); (b) - (i); (c) - (iv); (d) - (ii)  
(3) (a) - (iv); (b) - (iii); (c) - (ii); (d) - (i)  
(4) (a) - (ii); (b) - (iii); (c) - (i); (d) - (iv)
24. The compositional skills and creativity in presentation of students can be most effectively evaluated by which of the following tests?
- (1) Objective type tests (2) Essay type tests  
(3) Short answer tests (4) Projective type tests

25. Given below are two statements, one is labelled Assertion (A) and the other is labelled as Reason (R)

**Assertion (A)** : Pedagogy and social interaction are two major result-oriented activities of a teacher

**Reason (R)** : Communication has a limited role in both these activities

In the light of the above two statements, choose the correct option from those given below

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)  
(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)  
(3) (A) is true but (R) is false  
(4) (A) is false but (R) is true

**Based on the data in the table, answer the questions that follow (26 to 30)**

The table shows the percentage (%) profit earned by the Company A income of Company B and expenditure of Company B during the years, 2013 - 18 as well as formula to compute percentage (%) profit.

**Year wise Financial Details** (in Rs. Lakhs)

| Year | % Profit of A | Income of B<br>(in Rs Lakhs) | Expenditure of B<br>(in Rs Lakhs) |
|------|---------------|------------------------------|-----------------------------------|
| 2013 | 40%           | 48.6                         | 36                                |
| 2014 | 25%           | 35                           | 25                                |
| 2015 | 60%           | 62.4                         | 48                                |
| 2016 | 40%           | 77                           | 44                                |
| 2017 | 10%           | 80                           | 50                                |
| 2018 | 20%           | 72                           | 45                                |

$$\text{where Profit (\%)} = \frac{(\text{Income} - \text{Expenditure})}{(\text{Expenditure})} \times 100$$

26. If the income of the Company A in the year 2014 happened to be Rs 32.5 Lakhs, then what was the sum of the net profit (in Rs Lakhs) of Company A and Company B in 2014?
- (1) Rs 128 Lakhs (2) Rs 13.2 Lakhs  
(3) Rs 15 Lakhs (4) Rs 16.5 Lakhs
27. If the income of Company A in the year 2018 was Rs 90 Lakhs, then the net profit (in Rs Lakhs) of Company B in 2018 is what percent more than the net profit (in Rs Lakhs) of Company A?
- (1) 30% (2) 60%  
(3) 75% (4) 80%
28. The percent profit of Company B was maximum in the year ?
- (1) 2014 (2) 2015  
(3) 2016 (4) 2017
29. What is the difference between percent (%) profit of Company A and Company B in the year 2013 ?
- (1) 5% (2) 7%  
(3) 12% (4) 15%
30. If the expenditure of Company A in year 2017 was Rs 45 Lakhs, then the net profit (in Rs Lakhs) of Company A is what percent of net profit (in Rs Lakhs) of Company B in the same year?
- (1) 15% (2) 25%  
(3) 40% (4) 75%
31. Select the option that contains exclusively the text file formats
- (1) JPEG, MP3, RTF (2) CSV, RTF, TXT  
(3) GIF, JPEG, MP3 (4) CSV, MP3, PDF

32. Identify the correct group of diseases caused by polluted water
- (1) Cholera, Acute Diarrhoea, Typhoid and Polio
  - (2) Cholera, Typhoid, Enteritis and Tuberculosis
  - (3) Typhoid, Enteritis and Tuberculosis
  - (4) Cholera, Acute Diarrhoea, Typhoid and Tuberculosis
33. Which of the following statements is/are correct?
- (a) A Local Area Network (LAN) is usually located on one brand of computer
  - (b) The acronym 'ISP' stands for Internet Standard Provider
- Choose the correct answer from the options given below
- (1) (a) only
  - (2) (b) only
  - (3) Both (a) and (b)
  - (4) Neither (a) nor (b)
34. Suppose the concentration of Carbon dioxide, a greenhouse gas responsible for climate change, is 400 ppm. What is its concentration in air in percentage terms?
- (1) 0.04%
  - (2) 0.4%
  - (3) 0.004%
  - (4) 4.0%
35. The National Skills Qualifications Framework is based on which of the following?
- (1) Competency
  - (2) Technology
  - (3) Economic development
  - (4) Evaluation
36. Given below are two statements, one is labelled Assertion (A) and the other is labelled as Reason (R)
- Assertion (A): The clock speed of CPUs has not increased significantly in recent years
- Reason (R): Software now being used is faster and therefore processors do not have to be faster
- In the light of the above two statements, choose the correct option from those given below
- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
  - (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
  - (3) (A) is true but (R) is false
  - (4) (A) is false but (R) is true
37. Which of the following statements is/are correct?
- (a) The clock speed of a CPU is measured in hertz (Hz)
  - (b) Bluetooth technology consumes more power than Wi-Fi technology.
- Choose the correct answer from the options given below
- (1) (a) only
  - (2) (b) only
  - (3) Both (a) and (b)
  - (4) Neither (a) nor (b)
38. As per provisions of Paris Agreement, the Intended Nationally Determined Contributions (INDCs) are to be reviewed every
- (1) 15 years
  - (2) 10 years
  - (3) 5 years
  - (4) 3 years

39. Which among the following is the statutory function of the UGC?
- (1) To appoint teaching faculty in universities
  - (2) To control the conduct of examination in universities
  - (3) To determine and maintain the standards of teaching and research in universities
  - (4) To develop curriculum for university courses

40. Match List I with List II

| List I             | List II                                         |
|--------------------|-------------------------------------------------|
| (Software)         | (Description)                                   |
| (a) Web browser    | (i) Prepare written documents                   |
| (b) Word processor | (ii) Create and edit web pages                  |
| (c) Spreadsheet    | (iii) Connect to websites and display web pages |
| (d) Web authoring  | (iv) Analyze and summarize numerical data       |

Choose the correct answer from the options given below

- (1) (a) - (ii); (b) - (iv); (c) - (i); (d) - (iii)
  - (2) (a) - (iii); (b) - (i); (c) - (iv); (d) - (ii)
  - (3) (a) - (iii); (b) - (i); (c) - (ii); (d) - (iv)
  - (4) (a) - (ii); (b) - (i); (c) - (iv); (d) - (iii)
41. Hazardous solid waste from Industrial urban sources. Which sequence of the following salvage sequences is of increasing desirability in sequence?
- (1) Disorganized Dumping < Landfill < Incineration < Reuse
  - (2) Compost Composting < Landfill < Reuse < Incineration
  - (3) Landfill < Compost Manure < Reuse < Incineration
  - (4) Incineration < Compost Composting < Reuse < Landfill
42. Who among the following scholars carried back scriptures from Nalanda University and wrote about architecture and learning of this university?
- (1) Kim Huang (Korea)
  - (2) Jin Tan Vang (Korea)
  - (3) Xuan Zang (China)
  - (4) Junha Meng (China)
43. Identify the correct sequence of biomass fuels in terms of their energy content per unit mass
- (1) Dung (Dry) > Coconut Shells > Unsorted Domestic Refuse
  - (2) Unsorted Domestic Refuse > Coconut Shells > Dung (Dry)
  - (3) Wood (Dry) > Coconut Shells > Unsorted Domestic Refuse
  - (4) Coconut Shells > Dung (Dry) > Unsorted Domestic Refuse
44. Which among the following is a Massive Open Online Course platform created by the Ministry of Human Resource Development, Government of India?
- (1) PRATHAM
  - (2) SWAYAM
  - (3) FUTURELEARN
  - (4) OPEN LEARN

45. Which among the following recommended the establishment of State Council for Higher Education in each state?
- (1) Report of the Estimates Committee (1965 - 66)
  - (2) Review Committee on UGC (1977), Ministry of Education
  - (3) National Policy on Education (1986)
  - (4) Report of the UGC Committee (1990)

**Read the given passage and answer the questions that follow (46 to 50)**

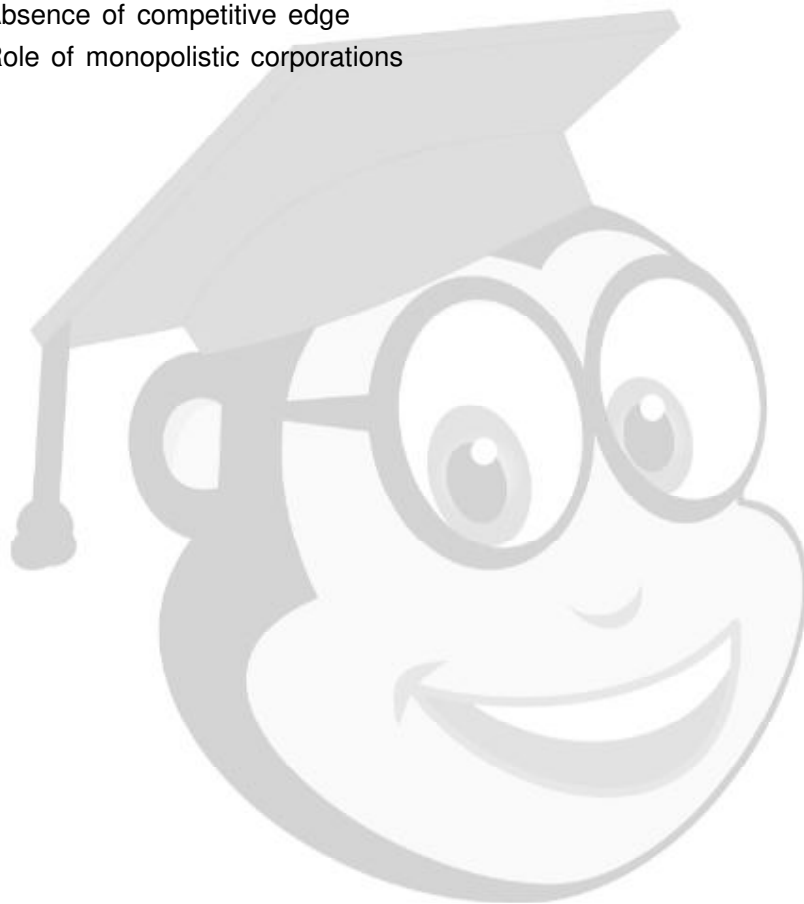
The motives for direct investments abroad are generally the same as earning higher returns, possibly resulting from higher growth rates abroad, more favorable tax treatment or greater availability of infrastructure and diversifying risks. Indeed, it has been found that firms with a strong international orientation, either through exports or through foreign production and/or sales facilities, are more profitable, and have a much smaller variability in profits than purely domestic firms. Although these reasons are sufficient to explain international investments they leave one basic question unanswered with regard to direct foreign investments. That is, they cannot explain why the residents of a nation do not borrow from other nations and themselves make real investments in their own nation rather than accept direct investments from abroad. After all, the residents of a nation can be expected to be more familiar with local conditions, and thus to be at a competitive advantage with respect to foreign investors. There are several explanations for this. The most important is that many large corporations, usually in monopolistic and oligopolistic markets, often have some unique production knowledge or managerial skill that could easily and profitably be utilized abroad and over which the corporation wants to retain direct control. In such a situation, the firm will make direct investments abroad. This involves horizontal integration or the production abroad of a differentiated product that is also produced at home. This helps serve the foreign market better by adapting to local conditions than through exports.

46. The passage focuses on the aspects mainly related to
- (1) Indirect control over investments
  - (2) International orientation of investment
  - (3) Sales facilities
  - (4) Risks involved in integration of production
47. The possible reasons for direct foreign investment can be
- (a) Higher returns
  - (b) better tax regimes
  - (c) Availability of infrastructure
  - (d) Risk mitigation
  - (e) Financial support from local investors

Choose the correct answer from the options given below

- |                           |                          |
|---------------------------|--------------------------|
| (1) (a), (d) and (e) only | (2) (b), (c) and d) only |
| (3) (a), (b) and (c) only | (4) (d), (e) and f) only |
48. Purely domestic firms are affected by
- |                                   |                                  |
|-----------------------------------|----------------------------------|
| (1) Low interest rates            | (2) Small variability of profits |
| (3) Larger variability of profits | (4) Export controls              |

49. What advantage do large corporations have in oligopolistic markets?
- (1) Direct control over profitability
  - (2) Large production of undifferentiated products
  - (3) Localization of managerial skills
  - (4) Eliminating barriers to higher profits
50. In the case of direct foreign investments, what factor remains unaddressed?
- (1) Acceptance of foreign investment
  - (2) Non-acceptance of foreign investment
  - (3) Absence of competitive edge
  - (4) Role of monopolistic corporations



### ANSWER KEY

| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|----|----|----|----|----|----|----|----|----|----|
| 1  | 1  | 3  | 1  | 1  | 3  | 4  | 4  | 3  | 3  |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 2  | 2  | 1  | 3  | 4  | 2  | 3  | 2  | 1  | 2  |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 4  | 1  | 3  | 2  | 3  | 4  | 4  | 3  | 1  | 1  |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 2  | 1  | 4  | 1  | 1  | 3  | 1  | 3  | 3  | 2  |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 1  | 3  | 4  | 2  | 3  | 2  | 3  | 3  | 1  | 2  |

# Computer Science & Applications

## Previous Year Solved Paper (Dec. 2019)

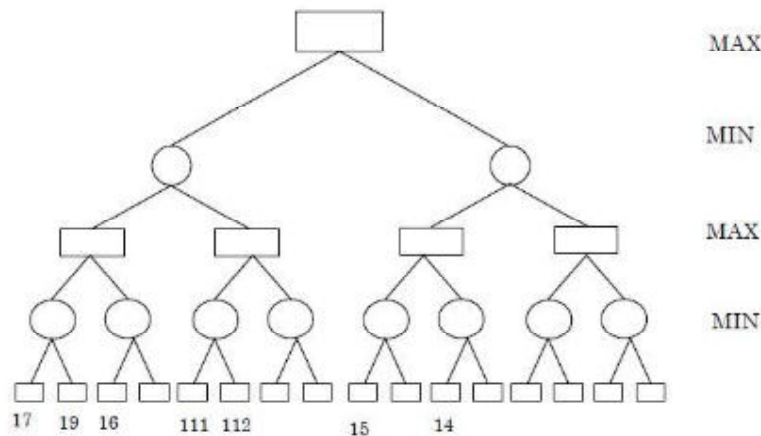
Time : 2 hours

Paper-II

Maximum Marks : 200

**Note :** This paper contains hundred (100) objective type questions, each question carries two (2) marks. Attempt all the questions.

- Java Virtual Machine (JVM) is used to execute architectural neutral byte code. Which of the following is needed by JVM for execution of Java Code?
  - Class loader only
  - Class loader and Java Interpreter
  - Class loader, Java Interpreter and API
  - Java Interpreter only
- Consider the game tree given below



Here ○ and □ represent MIN and MAX nodes respectively. The value of the root node of the game tree is :

- 14
  - 17
  - 111
  - 112
- Consider a paging system where translation lookaside buffer (TLB) a special type of associative memory is used with hit ratio of 80%  
Assume that memory reference takes 80 nanoseconds and reference time to TLB is 20 nanoseconds. What will be the effective memory access time given 80% hit ratio?
    - 110 nanoseconds
    - 116 nanoseconds
    - 200 nanoseconds
    - 100 nanoseconds

4. Consider the following grammar :

$$S \rightarrow 0A \mid 0BB$$

$$A \rightarrow 00A \mid \lambda$$

$$B \rightarrow 1B \mid 11C$$

$$C \rightarrow B$$

Which language does this grammar generate?

- (A)  $L((00)^*0 + (11)^*1)$  (B)  $L(0(11)^* + 1(00)^*)$   
 (C)  $L((00)^*0)$  (D)  $L(0(11)^*1)$

5. What is the output of following C program?

```
#include < stdio.h>
```

```
main()
```

```
{
```

```
 int i, j, x = 0
```

```
 for (i = 0; i < 5; ++i)
```

```
 for (j = 0; j < 1; ++j)
```

```
 {
```

```
 x += (i + j - 1)
```

```
 break :
```

```
 }
```

```
 printf ("%d", x);
```

```
}
```

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

6. According to Dempster-Shafer theory for uncertainty management,

- (A)  $Bel(A) + Bel(\neg A) \leq 1$  (B)  $Bel(A) + Bel(\neg A) \geq 1$   
 (C)  $Bel(A) + Bel(\neg A) = 1$  (D)  $Bel(A) + Bel(\neg A) = 0$

Where  $Bel(A)$  denotes Belief of event A.

7. A computer uses a memory unit of 512 K words of 32 bits each. A binary instruction code is stored in one word of the memory. The instruction has four parts: an addressing mode field to specify one of the two-addressing mode (direct and indirect), an operation code, a register code part to specify one of the 256 registers and an address part. How many bits are there in addressing mode part, opcode part, register code part and the address part?

- (A) 1, 3, 9, 19 (B) 1, 4, 9, 18  
 (C) 1, 4, 8, 19 (D) 1, 3, 8, 20

8. Let P be the set of all people. Let R be a binary relation on P such that (a, b) is in R if a is a brother of b. Is R symmetric transitive, an equivalence relation, a partial order relation?

- (A) NO,NO,NO,NO (B) NO,NO,YES,NO  
 (C) NO,YES,NO,NO (D) NO,YES,YES,NO

9. Consider the following grammars :

$$G_1 : S \rightarrow \alpha S b \mid b S \alpha \mid \alpha \alpha$$

$$G_2 : S \rightarrow \alpha S b \mid b S \alpha \mid S S \mid \lambda$$

$$G_3 : S \rightarrow \alpha S b \mid b S \alpha \mid S S \mid \alpha$$

$$G_4 : S \rightarrow \alpha S b \mid b S \alpha \mid S S \mid S S S \mid \lambda$$

Which of the following is correct w.r.t. the above grammars?

- (A)  $G_1$  and  $G_3$  are equivalent (B)  $G_2$  and  $G_3$  are equivalent  
(C)  $G_2$  and  $G_4$  are equivalent (D)  $G_3$  and  $G_4$  are equivalent

10. Which of the following interprocess communication model is used to exchange messages among co-operative processes?

- (A) Shared memory model  
(B) Message passing model  
(C) Shared memory and message passing model  
(D) Queues

11. What are the greatest lower bound (GLB) and the least upper bound (LUB) of the sets  $A = \{3, 9, 12\}$  and  $B = \{1, 2, 4, 5, 10\}$  if they exist in poset  $(\mathbb{Z}^+, |)$ ?

- (A)  $A(\text{GLB} - 3, \text{LUB} - 36)$ ;  $B(\text{GLB} - 1, \text{LUB} - 20)$   
(B)  $A(\text{GLB} - 3, \text{LUB} - 12)$ ;  $B(\text{GLB} - 1, \text{LUB} - 10)$   
(C)  $A(\text{GLB} - 1, \text{LUB} - 36)$ ;  $B(\text{GLB} - 2, \text{LUB} - 20)$   
(D)  $A(\text{GLB} - 1, \text{LUB} - 12)$ ;  $B(\text{GLB} - 2, \text{LUB} - 10)$

12. Consider the following learning algorithms:

- (a) Logistic repression  
(b) Back propagation  
(c) Linear repression

Which of the following option represents classification algorithms?

- (A) (a) and (b) only (B) (a) and (c) only  
(C) (b) and (c) only (D) (a), (b) and (c)

13. Let the population of chromosomes in genetic algorithm is represented in terms of binary number. The strength of fitness of a chromosomes in decimal form,  $x$ , is given by

$$Sf(x) = \frac{f(x)}{\sum f(x)} \text{ where } f(x) = x^2$$

The population is given by  $P$  where:

$$P = \{(01101), (11000), (01000), (10011)\}$$

The strength of fitness of chromosome (11000) is \_\_\_\_\_.

- (A) 24 (B) 576  
(C) 14.4 (D) 49.2

14. Consider the following language families :

$L_1 \equiv$  The context – free languages

$L_2 \equiv$  The context – sensitive languages

$L_3 \equiv$  The recursively enumerable languages

$L_4 \equiv$  The recursive languages

Which one of the following options is correct?

(A)  $L_1 \subseteq L_2 \subseteq L_3 \subseteq L_4$

(B)  $L_2 \subseteq L_1 \subseteq L_3 \subseteq L_4$

(C)  $L_1 \subseteq L_2 \subseteq L_4 \subseteq L_3$

(D)  $L_2 \subseteq L_1 \subseteq L_4 \subseteq L_3$

15. Consider a subnet with 720 routers. If a three-level hierarchy is chosen, with eight clusters, each containing 9 regions of 10 routers, then number of entries in hierarchical table of each router is

(A) 25

(B) 27

(C) 53

(D) 72

16. Identify the circumstances under which pre-emptive CPU scheduling is used :

(a) A process switches from Running state to Ready state

(b) A process switches from Waiting state to Ready state

(c) A process completes its execution

(d) A process switches from Ready to Waiting state

Choose the correct option :

(A) (a) and (b) only

(B) (a) and (d) only

(C) (c) and (d) only

(D) (a), (b), (c) only

17. Match List-I and List-II :

#### List-I

(a) Physical layer

(b) Transport layer

(c) Session layer

(d) Presentation layer

#### List-II

(i) Provide token management service

(ii) Concerned with transmitting raw bits over a communication channel

(iii) Concerned with the syntax and semantics of the information transmitted

(iv) True end-to-end layer from source to destination

Codes :

|     | (a)  | (b)   | (c)   | (d)   |
|-----|------|-------|-------|-------|
| (A) | (ii) | (iv)  | (iii) | (i)   |
| (B) | (iv) | (iii) | (ii)  | (i)   |
| (C) | (ii) | (iv)  | (i)   | (iii) |
| (D) | (iv) | (ii)  | (i)   | (iii) |

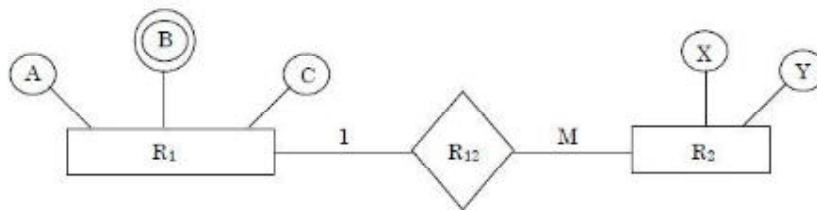
18. Give asymptotic upper and lower bound for  $T(n)$  given below. Assume  $T(n)$  is constant for  $n \leq 2$ .  $T(n) = 4T(\sqrt{n}) + \lg^2 n$

- (A)  $T(n) = \theta(\lg(\lg^2 n) \lg n)$  (B)  $T(n) = \theta(\lg^2 n \lg n)$   
 (C)  $T(n) = \theta(\lg^2 n \lg \lg n)$  (D)  $T(n) = \theta(\lg(\lg n) \lg n)$

19. Which of the following class of IP address has the last address as 223.255.255.255?

- (A) Class A (B) Class B  
 (C) Class C (D) Class D

20. Find minimum number of tables required for converting the following entity relationship diagram into relational database?



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

21. A rectangle is bound by the lines  $x = 0$ ;  $y = 0$ ;  $x = 5$  and  $y = 3$ . The line segment joining  $(-1, 0)$  and  $(4, 5)$ . If clipped against this window will connect the points \_\_\_\_\_.

- (A)  $(0, 1)$  and  $(3, 3)$  (B)  $(0, 1)$  and  $(2, 3)$   
 (C)  $(0, 1)$  and  $(4, 5)$  (D)  $(0, 1)$  and  $(3, 5)$

22. Which of the following methods are used to pass any number of parameters to the operating system through system calls?

- (A) Registers (B) Block or table in main memory  
 (C) Stack (D) Block in main memory and stack

23. Consider the following statements :

$S_1$  : These exists no algorithm for deciding if any two Turing machines  $M_1$  and  $M_2$  accept the same language.

$S_2$  : Let  $M_1$  and  $M_2$  be arbitrary Turing machines. The problem to determine  $L(M_1) \subseteq L(M_2)$  is undecidable.

Which of the statement is (are) correct?

- (A) Only  $S_1$  (B) Only  $S_2$   
 (C) Both  $S_1$  and  $S_2$  (D) Neither  $S_1$  nor  $S_2$

24. When using Dijkstra's algorithm to find shortest path in a graph, which of the following statements is not true?
- (A) It can find shortest path within the same graph data structure
  - (B) Every time a new node is visited, we choose the node with smallest known distance/cost(weight) to visit first
  - (C) Shortest path always passes through least number of vertices
  - (D) The graph needs to have a non-negative weight on every edge
25. An instruction is stored at location 500 with its address field at location 501. The address field has the value 400. A processor register  $R_1$  contains the number 200. Match the addressing mode (List-I) given below with effective address (List-II) for the given instruction :

**List-I**

- (a) Direct
- (b) Register indirect
- (c) Index with  $R_1$  as the index register
- (d) Relative

**List-II**

- (i) 200
- (ii) 902
- (iii) 400
- (iv) 600

**Codes :**

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (A) | (iii) | (i)   | (iv)  | (ii) |
| (B) | (i)   | (ii)  | (iii) | (iv) |
| (C) | (iv)  | (ii)  | (iii) | (i)  |
| (D) | (iv)  | (iii) | (ii)  | (i)  |

26. The order of schema ?10?101? and ???0??1 are \_\_\_\_\_ and \_\_\_\_\_ respectively.
- (A) 5,3
  - (B) 5,2
  - (C) 7,5
  - (D) 8,7
27. Let  $a^{2c} \bmod n = (a^c)^2 \bmod n$  and  $a^{2c+1} \bmod n = a \cdot (a^c)^2 \bmod n$ . For  $a = 7$ ,  $b = 17$  and  $n = 561$ , what is the value of  $a^b \bmod n$ ?
- (A) 160
  - (B) 166
  - (C) 157
  - (D) 67

28. Match List-I and List-II :

**List-I**

- (a) Isolated I/O
- (b) Memory mapped I/O
- (c) I/O interface
- (d) Asynchronous data transfer

**List-II**

- (i) Same set of control signal for I/O and memory communication
- (ii) separate instructions for I/O and memory communication
- (iii) requires control signals to be transmitted between the communicating units
- (iv) resolve the difference in central computer and peripherals

**Codes :**

|     | (a)  | (b)   | (c)   | (d)   |
|-----|------|-------|-------|-------|
| (A) | (ii) | (iii) | (iv)  | (i)   |
| (B) | (i)  | (ii)  | (iii) | (iv)  |
| (C) | (ii) | (i)   | (iv)  | (iii) |
| (D) | (i)  | (ii)  | (iv)  | (iii) |

**29.** Consider the following models "

$M_1$  : Mamdani model

$M_2$  : Takagi – Sugeno – Kang model

$M_3$  : Kosko's additive model (SAM)

Which of the following option contains examples of additive rule model?

- (A) Only  $M_1$  and  $M_2$  (B) Only  $M_2$  and  $M_3$   
 (C) Only  $M_1$  and  $M_3$  (D)  $M_1, M_2$  and  $M_3$

**30.** Consider the language  $L = \{a^n b^{n-3} \mid n > 2\}$  on  $\Sigma = \{a, b\}$ . Which one of the following grammars generates the language L?

- (A)  $S \rightarrow aA \mid a, A \rightarrow aAb \mid b$  (B)  $S \rightarrow aaA \mid \lambda, A \rightarrow aAb \mid \lambda$   
 (C)  $S \rightarrow aaaA \mid a, A \rightarrow aAb \mid \lambda$  (D)  $S \rightarrow aaaA, A \rightarrow aAb \mid \lambda$

**31.** In a system for a restaurant, the main scenario for placing order is given below : ;

- (a) Customer reads menu  
 (b) Customer places order  
 (c) Order is send to kitchen for preparation  
 (d) Ordered items are served  
 (e) Customer requests for a bill for the order  
 (f) Bill is prepared for this order  
 (g) Customer is given the bill  
 (h) Customer pays the bill

A sequence diagram for the scenario will have atleast how many objects among whom the messages will be exchanged.

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

**32.** Consider the following statements with respect to approaches to fill area on raster systems :

P : To determine the overlap intervals for scan lines that cross the area.

Q : To start from a given interior position and paint outward from this point until we encounter the specified boundary conditions.

Select the correct answer from the options given below :

- (A) P only (B) Q only  
 (C) Both P and Q (D) Neither P and Q

33. Which of the following algorithms is not used for line clipping?  
(A) Cohen-Sutherland algorithm (B) Sutherland–Hodgman Algorithm  
(C) Liang-Barsky algorithm (D) Nicholl-Lee-Nicholl algorithm
34. Given two tables EMPLOYEE (EID, ENAME, DEPTNO)  
DEPARTMENT (DEPTNO, DEPTNAME)  
Find the most appropriate statement of the given query :  
Select count (\*) 'total'  
from EMPLOYEE  
where DEPTNO IN (D1, D2)  
group by DEPTNO  
having count (\*) > 5  
(A) Total number of employees in each department D1 and D2?  
(B) Total number of employees of department D1 and D2 if their total is >5  
(C) Display total number of employees in both departments D1 and D2  
(D) The output of the query must have atleast two rows
35. A clique in an undirected graph  $G = \langle V, E \rangle$  is a subset  $V' \subseteq V$  of vertices, such that  
(A) If  $(u, v) \in E$  then  $u \in V'$  and  $v \in V'$   
(B) If  $(u, v) \in E$  then  $u \in V'$  and  $v \in V'$   
(C) Each pair of vertices in  $V'$  is connected by an edge  
(D) All pairs of vertices  $V'$  are not connected by an edge
36. Which tag is used to enclose any number of javascript statements in HTML document?  
(A) <code> (B) <script>  
(C) <title> (D) <body>
37. Let A be the base class in C++ and B be the derived class from A with protected inheritance. Which of the following statement is false for class B?  
(A) Member function of class B can access protected data of class A  
(B) Member function of class B can access public data of class A  
(C) Member function of class B cannot access private data of class A  
(D) Object of derived class B can access public base class data
38. Which of the component module of DBMS does rearrangement and possible ordering of operations, eliminate redundancy in query and use efficient algorithms and indexes during the execution of a query?  
(A) query compiler (B) query optimizer  
(C) Stored data manager (D) Database processor

39. Match the Agile Process models with the task performed during the model :

**List-I**

- (a) Scrum
- (b) Adaptive software development
- (c) Extreme programming
- (d) Feature-driven development

**List-II**

- (i) CRC cards
- (ii) Sprint backlog
- (iii) <action> the <result> <by/for/of/to> a(n) <object>
- (iv) Time box release plan

**Codes :**

- |     | (a)  | (b)   | (c)  | (d)   |
|-----|------|-------|------|-------|
| (A) | (ii) | (iv)  | (i)  | (iii) |
| (B) | (i)  | (iii) | (ii) | (iv)  |
| (C) | (ii) | (i)   | (iv) | (iii) |
| (D) | (i)  | (iv)  | (ii) | (iii) |

40. In a B-Tree, each node represents a disk block. Suppose one block holds 8192 bytes. Each key uses 32 bytes. In a B-tree of order M there are M – 1 keys. Since each branch is on another disk block. We assume a branch is of 4 bytes. The total memory requirement for a non-leaf node is

- |               |               |
|---------------|---------------|
| (A) 32 M – 32 | (B) 36 M – 32 |
| (C) 36 M – 36 | (D) 32 M – 36 |

41. Which of the following is not needed by an encryption algorithm used in Cryptography?

- |                |                  |
|----------------|------------------|
| (A) KEY        | (B) Message      |
| (C) Ciphertext | (D) User details |

42. Consider the following Linear programming problem (LPP) :

$$\text{Maximize } z = x_1 + x_2$$

Subject to the constraints :

$$x_1 + 2x_2 \leq 2000$$

$$x_1 + x_2 \leq 1500$$

$$x_2 \leq 600$$

$$\text{and } x_1, x_2 \geq 0$$

The solution of the above LPP is :

- |                                       |                                       |
|---------------------------------------|---------------------------------------|
| (A) $x_1 = 750, x_2 = 750, z = 1500$  | (B) $x_1 = 500, x_2 = 1000, z = 1500$ |
| (C) $x_1 = 1000, x_2 = 500, z = 1500$ | (D) $x_1 = 900, x_2 = 600, z = 1500$  |

43. The following multithreaded algorithm computes transpose of a matrix in parallel :
- ```

p Trans (X, Y, N)
if N = 1
then Y[1, 1] ← X[1,1]
else partition X into four (N/2) × (N/2) submatrices  $X_{11}, X_{12}, X_{21}, X_{22}$ 
partition Y into four (N/2) × (N/2) submatrices  $Y_{11}, Y_{12}, Y_{21}, Y_{22}$ 
spawn p Trans ( $X_{11}, Y_{11}, N/2$ )
spawn p Trans ( $X_{12}, Y_{12}, N/2$ )
spawn p Trans ( $X_{21}, Y_{21}, N/2$ )
spawn p Trans ( $X_{22}, Y_{22}, N/2$ )

```
- What is the asymptotic parallelism of the algorithm?
- (A) T_1/T_∞ or $\theta(N^2/\lg N)$ (B) T_1/T_∞ or $\theta(N/\lg N)$
(C) T_1/T_∞ or $\theta(\lg N/N^2)$ (D) T_1/T_∞ or $\theta(\lg N/N)$
44. Consider the following statements :
- S_1 : If a group $(G, *)$ is of order n , and $a \in G$ is such that $a^m = e$ for some integer $m \leq n$, then m must divide n .
- S_2 : If a group $(G, *)$ is of even order, then there must be an element $a \in G$ such that $a \neq e$ and $a * a = e$.
- Which of the statement is(are) correct?
- (A) Only S_1 (B) Only S_2
(C) Both S_1 and S_2 (D) Neither S_1 nor S_2
45. Given two tables $R1(x, y)$ and $R2(y, z)$ with 50 and 30 number of tuples respectively. Find maximum number of tuples in the output of natural join between tables $R1$ and $R2$ i.e. $R1 * R2$ (* - Natural Join)
- (A) 30 (B) 20
(C) 50 (D) 1500
46. A basic feasible solution of an $m \times n$ transportation problem is said to be non-degenerate, if basic feasible solution contains exactly _____ number of individual allocation in _____ positions.
- (A) $m + n + 1$, independent (B) $m + n - 1$, independent
(C) $m + n - 1$, appropriate (D) $m - n + 1$, independent
47. Match the following :
- | List-I | List-II |
|-----------------------------------|---|
| (a) Micro operation | (i) Specify micro operations |
| (b) Micro programmed control unit | (ii) Improve CPU utilization |
| (c) Interrupts | (iii) Control Memory |
| (d) Micro instruction | (iv) Elementary operation performed on data stored in registers |

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(iii)	(ii)	(i)
(B)	(iv)	(iii)	(i)	(ii)
(C)	(iii)	(iv)	(i)	(ii)
(D)	(iii)	(iv)	(ii)	(i)

48. Consider the following statements with respect to the language $L = \{a^n b^n | n \geq 0\}$

$S_1 : L^2$ is context free language

$S_2 : L^k$ is context-free language for any given $k \geq 1$

$S_3 : \bar{L}$ and L^* are context free languages

Which one of the following correct?

- (A) only S_1 and S_2 (B) only S_1 and S_3
 (C) only S_2 and S_3 (D) S_1, S_2 and S_3

49. Consider $\Sigma = \{w, x\}$ and $T = \{x, y, z\}$. Define homomorphism h by :

$$h(x) = xzy$$

$$h(w) = zxxy$$

If L is the regular language denoted by $r = (w + x^*) (ww)^*$, then the regular language $h(L)$ is given by

- (A) $(zxxy + xzy) (zxxy)$ (B) $(zxxy + (xzy)^*) (zxxyzxxy)^*$
 (C) $(zxxy + xzy) (zxxy)^*$ (D) $(zxxy + (xzy)^*) (zxxyzxxy)$

50. A micro instruction format has microoperation field which is divided into 2 subfields F1 and F2, each having 15 distinct microoperations, condition field CD for four status bits, branch field BR having four options used in conjunction with address field AD. The address space is of 128 memory words. The size of micro instruction is :

- (A) 19 (B) 18
 (C) 17 (D) 20

51. The full form of ICANN is

- (A) Internet Corporation for Assigned Names and Numbers
 (B) Internet Corporation for Assigned Numbers and Names
 (C) Institute of Cooperation for Assigned Names and Numbers
 (D) Internet Connection for Assigned Names and Numbers

52.

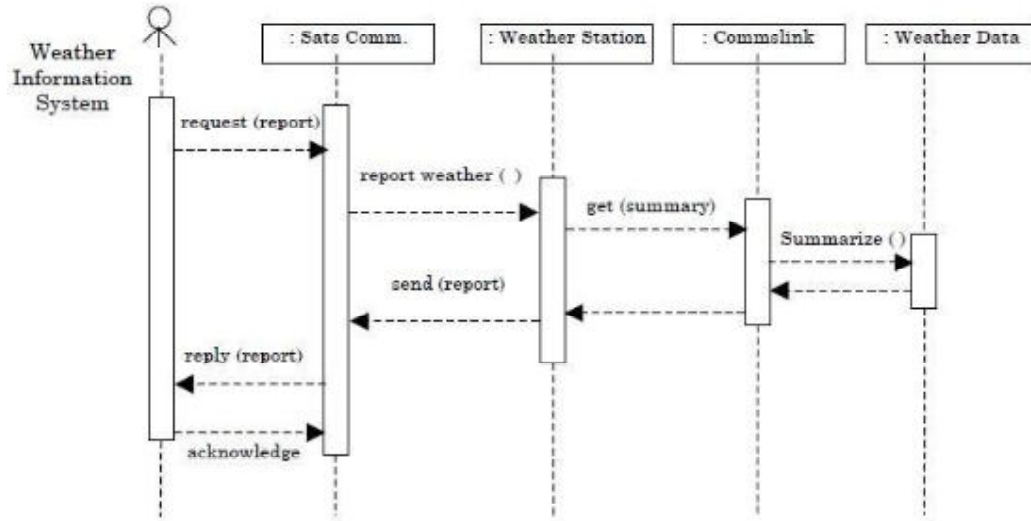


Figure 1

The sequence diagram given in Figure 1 for the Weather Information System takes place when an external system requests the summarized data from the weather station. The increasing order of lifeline for the objects in the system are :

- (A) Sat comms → Weather station → Comms link → Weather data
- (B) Sat comms → Comms link → Weather station → Weather data
- (C) Weather data → Comms link → Weather station → Sat Comms
- (D) Weather data → Weather stations → Comms link → Sat Comms

53. Suppose a system has 12 magnetic tape drives and at time t_0 , three processes are allotted tape drives out of their need as given below :

	Maximum Needs	Current Needs
p_0	10	5
p_1	4	2
p_2	9	2

At time t_0 , the system is in safe state. Which of the following is safe sequence so that deadlock is avoided?

- (A) $\langle p_0, p_1, p_2 \rangle$
- (B) $\langle p_1, p_0, p_2 \rangle$
- (C) $\langle p_2, p_1, p_0 \rangle$
- (D) $\langle p_0, p_2, p_1 \rangle$

54. The Reduced Instruction Set Computer (RISC) characteristics are :

- (a) Single cycle instruction execution
- (b) Variable length instruction formats
- (c) Instructions that manipulates operands in memory
- (d) Efficient instruction pipeline

Choose the correct characteristics from the options given below :

- (A) (a) and (b)
- (B) (b) and (c)
- (C) (a) and (d)
- (D) (c) and (d)

55. A non-pipelined system takes 30ns to process a task. The same task can be processed in a four-segment pipeline with a clock cycle of 10ns. Determine the speed up of the pipeline for 100 tasks.
- (A) 3 (B) 4
(C) 3.91 (D) 2.91

56. Let W_{ij} represents weight between node i at layer k and node j at layer $(k - 1)$ of a given multilayer perceptron. The weight updation using gradient descent method is given by

(A) $W_{ij}(t+1) = W_{ij}(t) + \alpha \frac{\partial E}{\partial W_{ij}}, 0 \leq \alpha \leq 1$

(B) $W_{ij}(t+1) = W_{ij}(t) - \alpha \frac{\partial E}{\partial W_{ij}}, 0 \leq \alpha \leq 1$

(C) $W_{ij}(t+1) = \alpha \frac{\partial E}{\partial W_{ij}}, 0 \leq \alpha \leq 1$

(D) $W_{ij}(t+1) = -\alpha \frac{\partial E}{\partial W_{ij}}, 0 \leq \alpha \leq 1$

Where α and E represents learning rate and Error in the output respectively.

57. Which of the following CPU scheduling algorithms is/are supported by LINUX operating system?
- (A) Non-preemptive priority scheduling
(B) Preemptive priority scheduling and time sharing CPU scheduling
(C) Time sharing scheduling only
(D) Priority scheduling only

58. Consider the following languages :

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

$$L_2 = \{ww^R \mid w \in \{a, b\}^*\} \text{ Where } R \text{ represent reversible operation.}$$

Which one of the following is (are) inherently ambiguous language(s)?

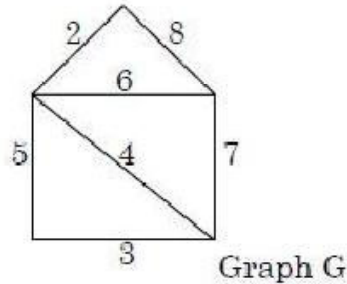
- (A) only L_1 (B) only L_2
(C) both L_1 and L_2 (D) neither L_1 or L_2

59. Given following equation:

$$(142)_b + (112)_{b-2} = (75)_8, \text{ find base } b.$$

- (A) 3 (B) 6
(C) 7 (D) 5

60. The weight of minimum spanning tree in graph G, calculated using Kruskal's algorithm is :



- (A) 14 (B) 15
(C) 17 (D) 18
61. How many reflexive relations are there on a set with 4 elements?
(A) 2^4 (B) 2^{12}
(C) 4^2 (D) 2
62. The following program is stored in the memory unit of the basic computer. Give the content of accumulator register in hexadecimal after the execution of the program.

Location	Instruction
010	CLA
011	ADD 016
012	BUN 014
013	HLT
014	AND 017
015	BUN 013
016	C1A5
017	93C6

- (A) A1B4 (B) 81B4
(C) A184 (D) 8184
63. Which of the following binary codes for decimal digits are self complementing?
(a) 8421 code (b) 2421 code
(c) excess-3 code (d) excess-3 gray code

Choose the correct options :

- (A) (a) and (b) (B) (b) and (c)
(C) (c) and (d) (D) (d) and (a)
64. Consider the following :
(a) Trapping at local maxima (b) Reaching a plateau
(c) Traversal along the ridge.
- Which of the following option represents shortcomings of the hill climbing algorithm?
- (A) (a) and (b) only (B) (a) and (c) only
(C) (b) and (c) only (D) (a), (b) and (c)

65. Consider the following statements :

$S_1 : \forall x P(x) \vee \forall x Q(x)$ and $\forall x (P(x) \vee Q(x))$ are not logically equivalent.

$S_2 : \exists x P(x) \wedge \exists x Q(x)$ and $\exists x (P(x) \vee Q(x))$ are not logically equivalent

Which of the following statements is/are correct?

- (A) Only S_1 (B) Only S_2
(C) Both S_1 and S_2 (D) Neither S_1 nor S_2

66. Let $G = (V, T, S, P)$ be any context-free grammar without any λ -productions or unit productions. Let K be the maximum number of symbols on the right of any production in P . The maximum number of production rules for any equivalent grammar in Chomsky normal form is given by :

- (A) $(K - 1)|P| + |T| - 1$ (B) $(K - 1)|P| + |T|$
(C) $K|P| + |T| - 1$ (D) $K|P| + |T|$

Where $| \cdot |$ denotes the cardinality of the set.

67. According to the ISO-9126 Standard Quality Model, match the attributes given in List-I with their definitions in List-II :

List-I

- (a) Functionality
(b) Reliability
(c) Efficiency
(d) Maintainability

List-II

- (i) Relationship between level of performance and amount of resources
(ii) Characteristics related with achievement of purpose
(iii) Effort needed to make for improvement
(iv) Capability of software to maintain performance of software

Codes :

- | | (a) | (b) | (c) | (d) |
|-----|------|------|-------|-------|
| (A) | (i) | (ii) | (iii) | (iv) |
| (B) | (ii) | (i) | (iv) | (iii) |
| (C) | (ii) | (iv) | (i) | (iii) |
| (D) | (i) | (ii) | (iv) | (iii) |

68. What is the worst case running time of Insert and Extract-min, in an implementation of a priority queue using an unsorted array? Assume that all insertions can be accommodated.

- (A) $\theta(1)$, $\theta(n)$ (B) $\theta(n)$, $\theta(1)$
(C) $\theta(1)$, $\theta(1)$ (D) $\theta(n)$, $\theta(n)$

69. If we want to resize a 1024×768 pixels image to one that is 640 pixels wide with the same aspect ratio, What would be the height of the resized image?

- (A) 420 Pixels (B) 460 Pixels
(C) 480 Pixels (D) 540 Pixels

70. Let $A = \{001, 0011, 11, 101\}$ and $B = \{01, 111, 111, 010\}$. Similarly, let $C = \{00, 001, 1000\}$ and $D = \{0, 11, 011\}$.

Which of the following pairs have a post-correspondence solution?

- (A) Only pair (A, B) (B) Only pair (C, D)
(C) Both (A, B) and (C, D) (D) Neither (A, B) nor (C, D)

71. The time complexity to multiply two polynomials of degree n using Fast Fourier transform method is ?

- (A) $\theta(n \lg n)$ (B) $\theta(n^2)$
(C) $\theta(n)$ (D) $\theta(\lg n)$

72. Given CPU time slice of 2ms and following list of processes.

Process	Burst time (ms)	Arrival time
p_1	3	0
p_2	4	2
p_3	5	5

Find average turnaround time and average waiting time using round robin CPU scheduling?

- (A) 4, 0 (B) 5.66, 1.66
(C) 5.66, 0 (D) 7, 2

73. Consider the following statements with respect to duality in LPP :

- (a) The final simplex table giving optimal solution of the primal also contains optimal solution of its dual in itself.
(b) If either the primal or the dual problem has a finite optimal solution, then the other problem also has a finite optimal solution.
(c) If either problem has an unbounded optimum solution, then the other problem has no feasible solution at all.

Which of the statements is (are) correct?

- (A) only (a) and (b) (B) only (a) and (c)
(C) only (b) and (c) (D) (a), (b) and (c)

74. An _____ chart is a project schedule representation that presents project plan as a directed graph. The critical path is the _____ sequence of _____ tasks and it defines project _____.

- (A) Activity, Shortest, Independent, Cost
(B) Activity, Longest, Dependent, Duration
(C) Activity, Longest, Independent, Duration
(D) Activity, Shortest, Dependent, Duration

75. Which of the following are legal statements in C programming language?
- (a) `int * P = &44;` (b) `int * P = &r;`
(c) `int P = &a;` (d) `int P = a;`
Choose the correct option :
- (A) (a) and (b) (B) (b) and (c)
(C) (b) and (d) (D) (a) and (d)
76. The Boolean expression $AB + A\bar{B} + \bar{A}C + AC$ is unaffected by the value of the Boolean variable _____.
- (A) A (B) B
(C) C (D) A, B and C
77. Piconet is a basic unit of a bluetooth system consisting of _____ master node and up to _____ active slave nodes.
- (A) one, five (B) one, seven
(C) two, eight (D) one, eight
78. Consider the following statements :
- (a) Fiber optic cable is much lighter than copper cable.
(b) Fiber optic cable is not affected by power surges or electromagnetic interference.
(c) Optical transmission is inherently bidirectional.
Which of the statements is (are) correct?
- (A) Only (a) and (b) (B) Only (a) and (c)
(C) Only (b) and (c) (D) (a), (b) and (c)
79. A tree has $2n$ vertices of degree 1, $3n$ vertices of degree 2, n vertices of degree 3. Determine the number of vertices and edges in tree.
- (A) 12, 11 (B) 11, 12
(C) 10, 11 (D) 9, 10
80. Match List-I with List-II :
- | List-I | List-II |
|---------------------------------|---|
| (a) Frame attribute | (i) to create link in HTML |
| (b) <code><tr></code> tag | (ii) for vertical alignment of content in cell |
| (c) Valign attribute | (iii) to enclose each row in table |
| (d) <code><a></code> tag | (iv) to specify the side of the table frame that display border |
- Codes :**
- | | (a) | (b) | (c) | (d) |
|-----|-------|-------|-------|------|
| (A) | (i) | (ii) | (iii) | (iv) |
| (B) | (ii) | (i) | (iii) | (iv) |
| (C) | (iv) | (iii) | (ii) | (i) |
| (D) | (iii) | (iv) | (ii) | (i) |

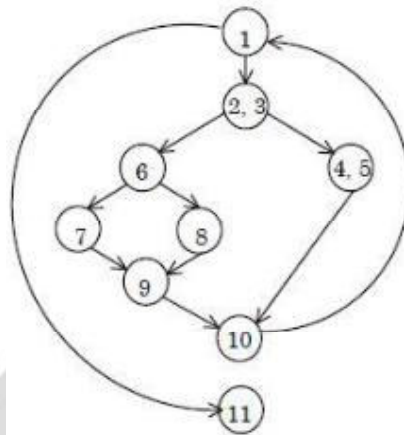
81. Consider the following statements :
- (a) Windows Azure is a cloud-based operating system
 - (b) Google App Engine is an integrated set of online services for consumers to communicate and share with others.
 - (c) Amazon Cloud Front is a web services for content delivery
- Which of the statements is (are) correct?
- (A) Only (a) and (b)
 - (B) Only (a) and (c)
 - (C) Only (b) and (c)
 - (D) (a), (b) and (c)
82. A counting semaphore is initialized to 8. 3 wait () operations and 4 signal () operations are applied. Find the current value of semaphore variable
- (A) 9
 - (B) 5
 - (C) 1
 - (D) 4
83. A network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network?
- (A) 1,000,000 bps
 - (B) 2,000,000 bps
 - (C) 12,000,000 bps
 - (D) 1,200,00,000 bps
84. Consider the following statements with respect to network security :
- (a) Message confidentiality means that the sender and the receiver expect privacy.
 - (b) Message integrity means that the data must arrive at the receiver exactly as they were sent.
 - (c) Message authentication means the receiver is ensured that the message is coming from the intended sender.
- Which of the statement is (are) correct?
- (A) Only (a) and (b)
 - (B) Only (a) and (c)
 - (C) Only (b) and (c)
 - (D) (a), (b) and (c)
85. Which of the following statements are true regarding C++?
- (a) Overloading gives the capability to an existing operator to operator on other data types.
 - (b) Inheritance in object oriented programming provides support to reusability.
 - (c) When object of a derived class is defined, first the constructor of derived class is executed then constructor of a base class is executed.
 - (d) Overloading is a type of polymorphism.
- Choose the correct option from those given below :
- (A) (a) and (b) only
 - (B) (a), (b) and (c) only
 - (C) (a), (b) and (d) only
 - (D) (b), (c) and (d) only
86. The Data Encryption Standard (DES) has a function consists of four steps. Which of the following is correct order of these four steps?
- (A) an expansion permutation, S-boxes, an XOR operation, a straight permutation
 - (B) an expansion permutation, an XOR operation, S-boxes, a straight permutation
 - (C) a straight permutation, S-boxes, an XOR operation, an expansion permutation
 - (D) a straight permutation, an XOR operations, S-boxes, an expansion permutation

87. Consider a weighted directed graph. The current shortest distance from source S to node x is represented by $d[x]$. Let $d[v] = 29$, $d[u] = 15$, $w[u, v] = 12$. What is the updated value of $d[v]$ based on current information ?
- (A) 29 (B) 27
(C) 25 (D) 17
88. Consider the following statements :
- (a) The running time of dynamic programming algorithm is always $\theta(\rho)$ where ρ is number of subproblems.
(b) When a recurrence relation has cyclic dependency, it is impossible to use that recurrence relation (unmodified) in a correct dynamic program.
(c) For a dynamic programming algorithm, computing all values in a bottom-up fashion is asymptotically faster than using recursion and memorization.
(d) If a problem X can be reduced to a known NP-hard problem, then X must be NP-hard.
- Which of the statement(s) is (are) true?
- (A) Only (b) and (a) (B) Only (b)
(C) Only (b) and (c) (D) Only (b) and (d)
89. A fuzzy conjunction operators, $t(x, y)$, and a fuzzy disjunction operator, $s(x, y)$, form a pair if they satisfy:
- $t(x, y) = 1 - s(1 - x, 1 - y)$
- If $t(x, y) = \frac{xy}{(x + y - xy)}$ then $s(x, y)$ is given by
- (A) $\frac{x + y}{1 - xy}$ (B) $\frac{x + y - 2xy}{1 - xy}$
(C) $\frac{x + y - xy}{1 - xy}$ (D) $\frac{x + y - xy}{1 + xy}$
90. Two concurrent executing transactions T_1 and T_2 are allowed to update same stock item say 'A' in an uncontrolled manner. In such scenario, following problems may occur :
- (a) Dirty read problem
(b) Lost update problem
(c) Transaction failure
(d) Inconsistent database state
- Which of the following option is correct if database system has no concurrency module and allows concurrent execution of above two transaction?
- (A) (a), (b) and (c) only (B) (c) and (d) only
(C) (a) and (b) only (D) (a), (b) and (d) only

Comprehension :

Answer the following question (91-95) based on flow graph F.

A flow graph F with entry node (1) and exit node (11) is shown below :



Flowgraph F

91. How many regions are there in flowgraph F?
 (A) 2 (B) 3
 (C) 4 (D) 5
92. How many predicate nodes are there and what are their names?
 (A) Three : (1, (2, 3), 6) (B) Three : (1, 4, 6)
 (C) Four : ((2, 3), 6, 10, 11) (D) Four : ((2, 3), 6, 9, 10)
93. How many nodes are there in the longest independent path?
 (A) 6 (B) 7
 (C) 8 (D) 9
94. What is the cyclomatic complexity of flowgraph F?
 (A) 2 (B) 3
 (C) 4 (D) 5
95. How many nodes are there in flowgraph F?
 (A) 9 (B) 10
 (C) 11 (D) 12

Comprehension :

Answer question (96-100) based on the problem statement given below :

An organization needs to maintain database having five attributes A, B, C, D, E. These attributes are functionally dependent on each other for which functional dependency set F is given as :
 $F : \{A \rightarrow BC, D \rightarrow E, BC \rightarrow D, A \rightarrow D\}$. Consider a universal relation $R(A, B, C, D, E)$ with functional dependency set F. Also all attributes are simple and take atomic values only.

96. Assume that given table R is decomposed in two tables $R_1(A, B, C)$ with functional dependency set $f_1 = \{A \rightarrow B, A \rightarrow C\}$ and $R_2(A, D, E)$ with FD set $F_2 = \{A \rightarrow D, D \rightarrow E\}$.
Which of the following option is true w.r.t. given decomposition?
- (A) Dependency preservation property is followed
 - (B) R_1 and R_2 are both in 2NF
 - (C) R_2 is in 2 NF and R_3 is in 3 NF
 - (D) R_1 is in 3 NF and R_2 in 2 NF
97. Identify the redundant functional dependency in F
- (A) $BC \rightarrow D$
 - (B) $D \rightarrow E$
 - (C) $A \rightarrow D$
 - (D) $A \rightarrow BC$
98. Identify primary key of table R with functional dependency set F
- (A) BC
 - (B) AD
 - (C) A
 - (D) AB
99. Identify the normal form in which relation R belong to
- (A) 1 NF
 - (B) 2 NF
 - (C) 3 NF
 - (D) BCNF
100. Minimal cover F' of functional dependency set F is
- (A) $F' = \{A \rightarrow B, A \rightarrow C, BC \rightarrow D, D \rightarrow E\}$
 - (B) $F' = \{A \rightarrow BC, B \rightarrow D, D \rightarrow E\}$
 - (C) $F' = \{A \rightarrow B, A \rightarrow C, A \rightarrow D, D \rightarrow E\}$
 - (D) $F' = \{A \rightarrow B, A \rightarrow C, B \rightarrow D, C \rightarrow D, D \rightarrow E\}$

ANSWER KEY

1	2	3	4	5	6	7	8	9	10
2	2	2	3	1	1	3	3	3	3
11	12	13	14	15	16	17	18	19	20
1	1	4	3	1	1	3	3	3	3
21	22	23	24	25	26	27	28	29	30
2	4	3	3	1	2	1	3	2	4
31	32	33	34	35	36	37	38	39	40
3	3	2	2	3	2	4	2	1	2
41	42	43	44	45	46	47	48	49	50
4	3	1	3	1	2	1	4	2	1
51	52	53	54	55	56	57	58	59	60
1	3	2	3	4	2	2	1	4	2
61	62	63	64	65	66	67	68	69	70
2	4	2	4	3	2	3	1	3	1
71	72	73	74	75	76	77	78	79	80
1	2	4	2	3	2	2	1	1	3
81	82	83	84	85	86	87	88	89	90
2	1	2	4	3	2	2	2	2	4
91	92	93	94	95	96	97	98	99	100
3	1	3	3	1	4	3	3	2	1

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