



UGC-NET/JRF-COMPUTER SCIENCE & APPLICATIONS PAPER - I : DECEMBER [2018]

Note : This paper consists of **Fifty (50)** objective type questions of **Two (2)** marks each. All questions are **compulsory**.

- The kind of numbers which do not represent amounts but instead represent kind (different qualities, types or categories) are called as :
(a) Prime (b) Absolute (c) Ordinal (d) Nominal
- Which among the following best describes emotional intelligence as a learner characteristic?
code:
(A) Recognise their own and other people's emotions
(B) Expressing their emotions strongly
(C) Use emotional information to guide thinking and behaviour
(D) Good observation, scientific thinking and deductive reasoning
(E) Adjusting emotions to adapt to environments
(F) Being creative and open to diverse viewpoints
(a) (C), (E) and (F) (b) (A), (D) and (F) (c) (A), (C) and (E) (d) (B), (D) and (E)
- Which among the following can best be used as an asynchronous teaching aid ?
(A) Skype (B) Blog (C) Facebook post (D) Online chat
(E) Email (F) Google Hangout
code:
(a) (C), (E) and (F) (b) (A), (B) and (C) (c) (A), (C) and (F) (d) (B), (C) and (E)
- In a school, in which there are large number of failures, you may like to develop test for eliminating those who are likely to have substantial difficulties in meeting the academic goals of teaching. For this you need to develop test which should be able to predict the individual's ability or readiness to undertake the study of a school subject successfully what is the name of such tests?
(a) Prognostic tests (b) Analytical tests (c) Attitude tests (d) Achievement tests
- When a reviewer reviews a research article without knowing the author's name, it is referred to as :
(a) Anonymous review (b) Blind review
(c) Uncategorised review (d) Behind-the curtain review
- In teaching learning context, results of an evaluation are useful to teachers in various ways. Which among the following is most important use for a teacher ?
(a) to decide placement of students in other institutions
(b) getting information about student's study interests
(c) planning instruction and knowing the effectiveness of the teaching strategies used by them.
(d) to identify home influence on students.
- The goal of formative assessment is to :
(a) Form a group of students on the basis of their learning
(b) Monitor student learning to provide on going feedback
(c) Compare student learning against a standard or benchmark
(d) Promote student to next level.



25. The challenging behaviours of students as related to communication are :
 (A) Purposive challenges (B) Critical challenges
 (C) Procedural challenges (D) Evaluation challenges
 (E) Practicality challenges (F) Power challenges
 Code:
 (a) (A), (B), (C) and (D) (b) (C), (D), (E) and (F)
 (c) (B), (C), (D) and (F) (d) (D), (E), (F) and (A)
26. Classroom communication has a basis in :
 (a) Intensive listener focus (b) Attention diversion
 (c) Audience fragmentation (d) Non-informative cues
27. The reasoning which would be helpful in seeking new knowledge of facts about the world is :
 (a) Demonstrative (b) Deductive (c) Inductive (d) Speculative
28. Effective classroom communication would help students internalise :
 (A) Knowledge (B) Subject matter (C) Articulation (D) Language felicity
 (E) Non-responsiveness (F) Modalities or resistance
 Code :
 (a) (A), (D), (E) and (F) (b) (C), (D), (E) and (F)
 (c) (A), (B), (C) and (D) (d) (B), (C), (D) and (E)
29. Inductive argument proceeds from :
 (a) Particulars to Universals (b) Particulars to Particulars
 (c) Universals to Universals (d) Universals to Particulars
30. In which of the following instances, deductive argument is invalid ?
 (a) When its premises are true but conclusion is false
 (b) When its premises and conclusion are all false
 (c) When its premises and conclusion are all true
 (d) When its premises are false and conclusion is true

COMPREHENSION FOR Q.31 TO Q.35

Subject	Total number of students appeared	Number of students who passed	Number of students who failed	Maximum/ Full marks in the subject
English	600	–	36	600
Mathematics	–	240	60	–
Science	300	216	–	400
Social Studies	360	–	48	400
Computer	–	168	32	400

Study the table given above carefully. It shows the number of students appeared, passed and failed in five subjects. The full marks in each subject is also given. Some of the cells have missing data. You might need to determine some of the missing data to answer the questions below.

31. What is the maximum marks that a student can score in all the five subjects together ?
 (You may use the answer of the previous question.)
 (a) 1500 (b) 2000 (c) 1000 (d) 500

32. What is the difference between the number of failed students in Science and the number of passes Social studies ?
 (a) 218 (b) 312 (c) 228 (d) 238
33. In which subject, was the failure percent the least ?
 (a) Social Studies (b) Science (c) English (d) Mathematics
34. What is the approximate difference in percentage between the pass % in Social Studies and the pass % in Mathematics ?
 (a) 26.5 % (b) 6.5 % (c) 2.5 % (d) 16.5 %
35. Which of the following could be the full marks in Mathematics if the pass marks in Mathematics was 35% and the person who just passes scored 70 ?
 (a) 200 (b) 500 (c) 600 (d) 400
36. Which of the given statements are true?
 (A) Modem is a Networking device
 (B) Modem is a Voltage stabilizer
 (C) Modem converts analogue signal to digital signal and vice-versa.
 Code :
 (a) (B) and (C) (b) (A), (B) and (C) (c) (A) and (C) (d) (A) and (B)
37. In 1948, under whose Chairmanship a University Education Commission was set up to reconstruct University Education in India ?
 (a) Dr. S. Radhakrishnan (b) Prof. P.C. Joshi
 (c) Dr. Vikaram Sarabhai (d) Sardar Vallabh Bhai Patel
38. A Terabyte is equal to
 (a) 1024 Gigabytes (b) 1024×1024 Kilobytes
 (c) 1024 Kilobytes (d) 1024 Megabytes
39. Which among the following industries, consumes maximum water in India ?
 (a) Paper and pulp (b) Engineering
 (c) Textiles (d) Thermal power plants
40. The Council of Rural Institutes Authority is situated at :
 (a) Hyderabad (b) Pune (c) Ahmedabad (d) Ludhiana
41. The first Open University established in India is :
 (a) Nalanda Open University, Patna
 (b) Bhim Rao Ambedkar Open University, Hyderabad
 (c) Yashwantrao Chavan Maharashtra Open University, Nasik
 (d) Tamil Nadu Open University, Chennai
42. The biggest hindrance in using biomass as a major energy source is :
 (a) Technology not well developed for commercialisation
 (b) Large amount of land required to grow energy crops
 (c) Energy yield of low level.
 (d) Air pollution due to combustion
43. Assertion (A) : Climate change is going to increase social tension in India
 Reason (R) : The frequency and intensity of the extreme weather events will have serious consequences for food security.
 Code :
 (a) (A) is true, but (R) is false
 (b) (A) is false, but (R) is true

- (c) Both (A) and (R) are true and (R) is not the correct explanation of (A)
 (d) Both (A) and (R) are true and (R) is the correct explanation of (A)
44. Full form of PDF is :
 (a) Portable Document Format (b) Portable Document Form
 (c) Portable Data Format (d) Portable Data Form
45. DNS stands for :
 (a) Dynamic Name Standard (b) Domain Name Standard
 (c) Distributed Name System (d) Domain Name System
46. Plants suitable for biomonitoring of Sulphur Dioxide pollution are :
 (a) Apricot, peach and gladiolus (b) White pine, moss and lichens
 (c) Tomato and lettuce (d) Tobacco, grapes and garden bean
47. The binary equivalent of $(-23)_{10}$ is (2's complement system for negative numbers is used)
 (a) 01010 (b) 01001 (c) 10111 (d) 01000
48. An earthquake is rated as 'major' if its magnitude in Richter Scale is in the range of :
 (a) 7.0 – 7.9 (b) 4.0 – 4.9 (c) 6.0 – 6.9 (d) 5.0 – 5.9
49. University and University-level institutions are categorised into
 (A) Central Universities (B) State Universities
 (C) Private Universities (D) Deemed-to-be Universities
 (E) Institutions of Higher Learning (F) Civil Sector Institutions
 Code :
 (a) (A), (C), (E) and (F) (b) (A), (B) (C) and (D)
 (c) (B), (D), (E) and (F) (d) (C), (D) (E) and (F)
50. "e-Pathshala" is an initiative by :
 (a) NCERT (b) NCTE (c) UGC (d) CBSE

***** END OF THE QUESTION PAPER *****

CAREER ENDEAVOUR



UGC-NET/JRF-COMPUTER SCIENCE & APPLICATIONS

PAPER-II : DECEMBER [2018]

Note : This paper consists of **Hundred (100)** objective type questions of **Two (2)** marks each. All questions are **compulsory**.

- Consider a system with 2 level cache. Access times of Level 1 cache, Level 2 cache and main memory are 0.5 ns, 5 ns and 100 ns respectively. The hit rates of Level 1 and Level 2 caches are 0.7 and 0.8, respectively. What is the average access time of the system ignoring the search time within the cache ?
 (a) 24.35 ns (b) 35.20 ns (c) 7.55 ns (d) 20.75 ns
- To overcome difficulties in Readers-Writers problem, which of the following statement(s) is/are TRUE ?
 (i) Writers are given exclusive access to shared objects.
 (ii) Readers are given exclusive access to shared objects.
 (iii) Both Readers and Writers are given exclusive access to shared objects.
 Choose the correct answer from the code given below :
 (a) (ii) only (b) (iii) only (c) Both (ii) and (iii) (d) (i) only
- A full joint distribution for the Toothache, Cavity and Catch is given in the table below :

	Toothache		¬Toothache	
	Catch	¬Catch	Catch	¬Catch
Cavity	0.108	0.012	0.072	0.008
¬Cavity	0.016	0.064	0.144	0.576

- What is the probability of Cavity, given evidence of Toothache ?
 (a) $\langle 0.2, 0.8 \rangle$ (b) $\langle 0.6, 0.4 \rangle$ (c) $\langle 0.6, 0.8 \rangle$ (d) $\langle 0.4, 0.8 \rangle$
- Consider a relation schema $R = (A, B, C, D, E, F)$ on which the following functional dependence hold :
 $A \rightarrow B$
 $B, C \rightarrow D$
 $E \rightarrow C$
 $D \rightarrow A$
 What are the candidate keys of R ?
 (a) AEF, BEF and BCF (b) AE, BE and DE
 (c) AEF, BEF and DEF (d) AE and BE
 - Match List-I with List-II and choose the answer from the code given below :

List-I

[Graph Algorithm]

- Dijkstra's algorithm
- Kruskal's algorithm
- Floyd-Warshall algorithm
- Topological sorting

List-II

[Time Complexity]

- $O(E \log E)$
- $\Theta(V^3)$
- $O(V^2)$
- $\Theta(V + E)$

where V and E are the number of vertices and edges in graph respectively.

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



6. An agent can improve its performance by
 (a) Learning (b) Responding (c) Perceiving (d) Observing
7. The elements 42, 25, 30, 40, 22, 35, 26 are inserted one by one in the given order into a max-heap. The resultant max-heap is stored in an array implementation as
 (a) <42, 40, 35, 25, 22, 30, 26> (b) <42, 40, 35, 25, 22, 26, 30>
 (c) <42, 35, 40, 22, 25, 30, 26> (d) <42, 35, 40, 22, 25, 26, 30>
8. Match List-I with List-II and choose the correct answer from the code given below :
- | | |
|-------------------|--|
| List-I | List-II |
| A. Equivalence | 1. $p \Rightarrow q$ |
| B. Contrapositive | 2. $p \Rightarrow q : q \Rightarrow p$ |
| C. Converse | 3. $p \Rightarrow q : \sim q \Rightarrow \sim p$ |
| D. Implication | 4. $p \Leftrightarrow q$ |
- Codes :
- (a) A-1, B-2, C-3, D-4 (b) A-3, B-4, C-2, D-1
 (c) A-2, B-1, C-3, D-4 (d) A-4, B-3, C-2, D-1
9. Consider the following boolean equations :
 (i) $wx + w(x + y) + x(x + y) = x + wy$ (ii) $(w\bar{x}(y + x\bar{z}) + \bar{w}\bar{x})y = \bar{x}y$
 What can you say about the above equations ?
 (a) Both (i) and (ii) are true (b) (i) is true and (ii) is false
 (c) Both (i) and (ii) are false (d) (i) is false and (ii) is true
10. Suppose for a process P, reference to pages in order are 1, 2, 4, 5, 2, 1, 2, 4. Assume that main memory can accommodate 3 pages and the main memory has already pages 1 and 2 in the order 1-first, 2-second. At this moment, assume FIFO page replacement algorithm is used then the number of page faults that occur to complete the execution of process P is
 (a) 3 (b) 5 (c) 6 (d) 4
11. Consider the following set of processes and the length of CPU burst time given in milliseconds :

Process	CPU
	Burst time (ms)
P ₁	5
P ₂	7
P ₃	6
P ₄	4

- Assume that processes being scheduled with Round-Robin Scheduling Algorithm with time quantum 4 ms. Then the waiting time for P₄ is _____ ms.
 (a) 0 (b) 4 (c) 6 (d) 12
12. The relations \leq and $<$ on a boolean algebra are defined as :
 $x \leq y$ if and only if $x \vee y = y$
 $x < y$ means $x \leq y$ but $x \neq y$
 $x \geq y$ means $y \leq x$ and
 $x > y$ means $y < x$
 Considering the above definitions, which of the following is NOT TRUE in the boolean algebra ?
 (i) If $x \leq y$ and $y \leq z$, then $x \leq z$ (ii) If $x \leq y$ and $y \leq x$, then $x = y$
 (iii) If $x < y$ and $y < z$, then $x \leq y$ (iv) If $x < y$ and $y < z$, then $x < y$
 Codes :
 (a) (ii) and (iii) only (b) (iii) only (c) (i) and (ii) only (d) (iv) only

13. The grammar $S \rightarrow (S) | SS | \epsilon$ is not suitable for predictive parsing because the grammar is
 (a) Ambiguous (b) Left recursive
 (c) An operator grammar (d) Right recursive
14. The four byte IP address consists of
 (a) Both network and host addresses (b) Network address
 (c) Host address (d) Neither network nor host address
15. Suppose a cloud contains software stack such as operating systems, application softwares, etc. This model is referred as _____ model.
 (a) MaaS (b) IaaS (c) PaaS (d) SaaS
16. The number of substrings that can be formed from string given by a d e f b g h n m p, is
 (a) 55 (b) 56 (c) 45 (d) 10
17. A clustering index is defined on the fields which are of type
 (a) non-key and non-ordering (b) key and ordering
 (c) key and non-ordering (d) non-key and ordering
18. Consider the following two languages :
 $L_1 = \{x \mid \text{for some } y \text{ with } |y| = 2^{|x|}, xy \in L \text{ and } L \text{ is regular language}\}$
 $L_2 = \{x \mid \text{for some } y \text{ such that } |x| = |y|, xy \in L \text{ and } L \text{ is regular language}\}$
 Which one of the following is correct ?
 (a) Both L_1 and L_2 are not regular languages (b) Only L_1 is regular language
 (c) Both L_1 and L_2 are regular languages (d) Only L_2 is regular language
19. Consider a disk pack with 32 surfaces, 64 tracks and 512 sectors per pack, 256 bytes of data are stored in a bit serial manner in a sector. The number of bits required to specify a particular sector in the disk is
 (a) 19 (b) 20 (c) 18 (d) 22
20. Consider R to be any regular language and L_1, L_2 be any two context-free languages. Which one of the following is CORRECT ?
 (a) \bar{L}_1 is context free (b) $L_1 \cap L_2$ is context free
 (c) $L_1 - R$ is context free (d) $(L_1 \cup L_2) - R$ is context free
21. The decimal floating point number -40.1 represented using IEEE-754 32-bit representation and written in hexadecimal form is
 (a) 0xC2206000 (b) 0xC2206666 (c) 0xC2006000 (d) 0xC2006666
22. An attribute A of datatype varchar(20) has the value 'xyz' and the attribute B of datatype char(20) has the value "lmnop", then the attribute A has _____ spaces and attribute B has _____ spaces.
 (a) 20, 20 (b) 3, 20 (c) 3, 5 (d) 20, 5
23. A box contains six red balls and four green balls. Four balls are selected at random from the box. What is the probability that two of the selected balls will be red and two will be green ?
 (a) 1/35 (b) 1/14 (c) 1/9 (d) 3/7
24. Which of the following problems is decidable for recursive languages (L) ?
 (a) Is $L = \Sigma^*$? (b) Is $L = R$, where R is a given regular set ?
 (c) Is $L = \phi$? (d) Is $w \in L$, where w is a string ?
25. In 3D graphics, which of the following statements about perspective and parallel projection is/are TRUE ?
 P: In a perspective projection, the farthest an object is from the centre of projection, the smaller it appears.
 Q: Parallel projection is equivalent to a perspective projection where the viewer is standing infinitely far away.

R: Perspective projections do not preserve straight lines.

Choose the correct answer from the code given below :

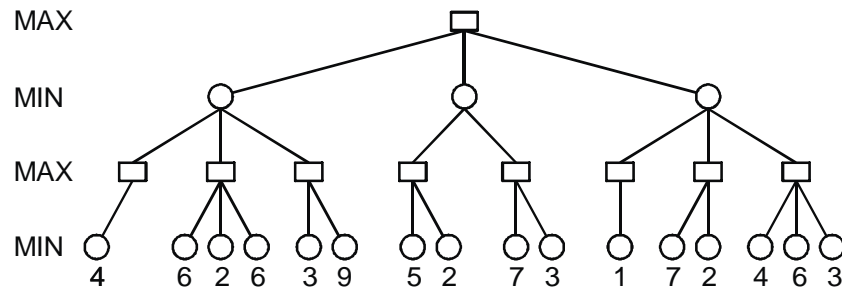
Codes :

- (a) P, Q and R (b) P and R only (c) Q and R only (d) P and Q only

26. If the frame buffer has 10-bits per pixel and 8-bits are allocated for each of the R, G and B components, then what would be the size of the color lookup table (LUT) ?

- (a) $(2^{10} + 2^{11})$ bytes (b) $(2^{10} + 2^8)$ bytes (c) $(2^8 + 2^9)$ bytes (d) $(2^{10} + 2^{24})$ bytes

27. Consider the following minimax game tree search



What will be the value propagated at the root ?

- (a) 3 (b) 4 (c) 6 (d) 5

28. Consider the sentence below.

“There is a country that borders both India and Nepal”.

Which of the following represents the above sentence correctly ?

- (a) $\exists c \text{ Country}(c) \wedge \text{Border}(c, \text{India}) \wedge \text{Border}(c, \text{Nepal})$
 (b) $\exists c \text{ Country}(c) \Rightarrow [\text{Border}(c, \text{India}) \wedge \text{Border}(c, \text{Nepal})]$
 (c) $\exists c \text{ Border}(\text{Country}(c), \text{India} \wedge \text{Nepal})$
 (d) $[\exists c \text{ Country}(c)] \Rightarrow [\text{Border}(c, \text{India}) \wedge \text{Border}(c, \text{Nepal})]$

29. Consider a singly linked list. What is the worst case time complexity of the best-known algorithm to delete the node a, pointer to this node is q, from the list ?

- (a) $O(\log n)$ (b) $O(n)$ (c) $O(1)$ (d) $O(n \log n)$

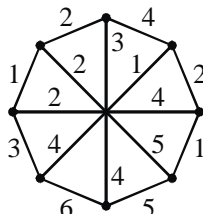
30. Which of the following statement(s) is/are TRUE ?

- (i) Window XP supports both peer-peer and client-server networks.
 (ii) Windows XP implements transport protocols as drivers that can be loaded and unloaded from the system dynamically.

Choose the correct answer from the code given below :

- (a) (i) only (b) (ii) only (c) Neither (i) nor (ii) (d) Both (i) and (ii)

31. Consider the graph shown below :



Use Kruskal's algorithm to find the minimum spanning tree of the graph.

The weight of this minimum spanning tree is

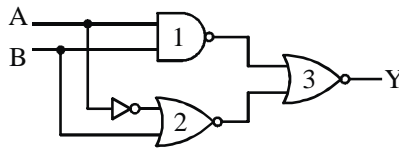
- (a) 13 (b) 17 (c) 16 (d) 14

32. Which of the following is true for semi-dynamic environment ?

- (a) The environment itself does not change with the passage of time but the agent's performance score does.
 (b) Environment and performance score, both change simultaneously.

- (c) Even if the environment changes with the passage of time while deliberating, the performance score does not change.
- (d) The environment may change while the agent is deliberating.

33. Find the boolean expression for the logic circuit shown below:



(1-NAND gate, 2-NOR gate, 3-NOR gate)

- (a) AB (b) $A\bar{B}$ (c) $\bar{A}B$ (d) $\bar{A}\bar{B}$
34. Consider the following recursive Java function f that takes two long arguments and return a float value :

```
public static float f(long m, long n)
{
    float result = (float)m/(float)n;
    if (m < 0 || n < 0)
        return 0.0f;
    else
        result += f(m*2, n*3);
    return result;
}
```

Which of the following integers best approximates the values of $f(2, 3)$?

- (a) 3 (b) 0 (c) 1 (d) 2
35. Consider the following x86 - assembly language instruction :

```
MOV AL, 153
NEG AL
```

The contents of the destination register AL (in 8-bit binary) notation, the status of Carry Flag (CF) and Sign Flag (SF) after the execution of above instructions, are

- (a) $AL = 0110\ 0110$; $CF = 1$; $SF = 1$ (b) $AL = 0110\ 0110$; $CF = 0$; $SF = 0$
- (c) $AL = 0110\ 0111$; $CF = 0$; $SF = 1$ (d) $AL = 0110\ 0111$; $CF = 1$; $SF = 0$
36. What does the following Java function perform ? (Assume int occupies four bytes of storage)

```
public static int f(int a)
{
    //Pre-conditions : a > 0 and no overflow/underflow occurs
    int b = 0;
    for (int i = 0; i < 32; i++)
    {
        b = b << 1;
        b = b | (a & 1);
        a = a >>> 1; //This is a logical shift
    }
    return b;
}
```

- (a) Returns the int that has the binary representation of integer a.
- (b) Return the int that represents the number of 1's in the binary representation of integer a.
- (c) Return the int that has the reversed binary representation of integer a.
- (d) Return the int that represents the number of 0's in the binary representation of integer a.

37. Let $r = a(a + b)^*$, $s = aa^*b$ and $t = a * b$ be three regular expressions. Consider the following:
- (i) $L(s) \subseteq L(r)$ and $L(s) \subseteq L(t)$ (ii) $L(r) \subseteq L(s)$ and $L(s) \subseteq L(t)$
- Choose the correct answer from the code given below :
- (a) Only (ii) is correct (b) Both (i) and (ii) are correct
(c) Only (i) is correct (d) Neither (i) nor (ii) is correct
38. Consider the following statements :
- (i) Auto increment addressing mode is useful in creating self-relocating code.
(ii) If auto increment addressing mode is included in an instruction set architecture, then an additional ALU is required for effective address calculation.
(iii) In auto increment addressing mode, the amount of increment depends on the size of the data item accessed.
- Which of the above statements is/are true ?
- (a) (ii) and (iii) only (b) (iii) only (c) (ii) only (d) (i) and (ii) only
39. In K-coloring of an undirected graph $G = (V, E)$ is a function $c : V \rightarrow \{0, 1, \dots, K - 1\}$ such that $c(u) \neq c(v)$ for every edge $(u, v) \in E$. Which of the following is not correct ?
- (a) G is bipartite (b) G is 2-colorable
(c) G has no cycles of odd length (d) G has cycles of odd length
40. Match the following Secret Key Algorithm (List-I) with the corresponding key lengths (List-II) and choose the correct answer from the code given below.
- | List-I | List-II |
|---------------|-------------------|
| A. Blowfish | 1. 128 - 256 bits |
| B. DES | 2. 128 bits |
| C. IDEA | 3. 1 - 448 bits |
| D. RC5 | 4. 56 bits |
- Codes :
- (a) A-3, B-4, C-2, D-1 (b) A-4, B-3, C-2, D-1
(c) A-2, B-3, C-4, D-1 (d) A-3, B-4, C-1, D-2
41. In mathematical logic, which of the following are statements ?
- (i) There will be snow in January. (ii) What is the time now ?
(iii) Today is Sunday. (iv) You must study Discrete Mathematics.
- Choose the correct answer from the code given below :
- (a) (i) and (ii) (b) (iii) and (iv) (c) (ii) and (iv) (d) (i) and (iii)
42. Consider the following terminology and match List-I with List-II and choose the correct answer from the code given below.
- b = branching factor
d = depth of the shallowest solution
m = maximum depth of the search tree
 ℓ = depth limit
- | List-I | List-II |
|-------------------------------|---------------------------|
| [Algorithms] | [Space Complexity] |
| A. BFS search | 1. $O(bd)$ |
| B. DFS search | 2. $O(b^d)$ |
| C. Depth-limited search | 3. $O(bm)$ |
| D. Iterative deepening search | 4. $O(b^\ell)$ |
- Codes:
- (a) A-2, B-3, C-4, D-1 (b) A-1, B-3, C-4, D-2
(c) A-3, B-2, C-4, D-1 (d) A-1, B-2, C-4, D-3

43. If a graph (G) has no loops or parallel edges, and if the number of vertices (n) in the graph is $n \geq 3$, then graph G is Hamiltonian if
- $\deg(v) \geq \frac{n}{3}$ for each vertex v
 - $\deg(v) + \deg(w) \geq n$ whenever v and w are not connected by an edge
 - $E(G) \geq \frac{1}{3}(n-1)(n-2) + 2$
- Choose the correct answer from the code given below :
- (a) (i) and (iii) only (b) (ii) and (iii) only (c) (ii) only (d) (iii) only
44. A binary search tree is constructed by inserting the following numbers in order:
60, 25, 72, 15, 30, 68, 101, 13, 18, 47, 70, 34
The number of nodes in the left subtree is
- (a) 3 (b) 6 (c) 7 (d) 5
45. Consider the following two C++ programs P1 and P2 and two statements S1 and S2 about these programs:
- | P1 | P2 |
|---|--|
| <pre>void f(int a, int *b, int &c) { a = 1; *b = 2; c = 3; } int main() { int i = 0; f(i, &i, i); cout << i; } </pre> | <pre>double a = 1, b = 2; double &f(double &d) { d = 4; return b; } int main() { f(a) = 5; cout << a << " . " << b; } </pre> |
- S1: P1 prints out 3
S2: P2 prints out 4 : 2
- What can you say about the statements S1 and S2 ?
- (a) Only S1 is true (b) Only S2 is true
(c) Both S1 and S2 true (d) Neither S1 nor S2 is true
46. Use dual simplex method to solve the following problem:
Maximize $z = -2x_1 - 3x_2$
Subject to:
- $$\begin{aligned} x_1 + x_2 &\geq 2 \\ 2x_1 + x_2 &\leq 10 \\ x_1 + x_2 &\leq 8 \\ x_1, x_2 &\geq 0 \end{aligned}$$
- (a) $x_1 = 0, x_2 = 2$ and $z = -6$ (b) $x_1 = 2, x_2 = 0$ and $z = -4$
(c) $x_1 = 2, x_2 = 6$ and $z = -22$ (d) $x_1 = 6, x_2 = 2$ and $z = -18$
47. A process residing in main memory and ready and waiting for execution, is kept on
- (a) Ready queue (b) Job queue (c) Execution queue (d) Wait queue
48. A computer uses a memory unit with 256 K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has four parts : an indirect bit, an operation code and a register code part to specify one of 64 registers and an address part. How many bits are there in the operation code, the register code part and the address part ?
- (a) 18, 7, 7 (b) 6, 7, 18 (c) 7, 6, 18 (d) 7, 7, 18

49. Consider the following pseudo-code fragment, where m is a non-negative integer that has been initialized :
- ```
p = 0;
k = 0;
while (k < m)
 p = p + 2k;
 k = k + 1;
end while
```
- Which of the following is a loop invariant for the while statement ?  
(Note : a loop invariant for a while statement is an assertion that is true each time the guard is evaluated during the execution of the while statement).
- (a)  $p = 2^k - 1$  and  $0 \leq k < m$                       (b)  $p = 2^k - 1$  and  $0 \leq k \leq m$   
(c)  $p = 2^{k+1} - 1$  and  $0 \leq k < m$                       (d)  $p = 2^{k+1} - 1$  and  $0 \leq k \leq m$
50. Suppose a system has 12 instances of some resource with  $n$  processes competing for that resource. Each process may require 4 instances of the resource. The maximum value of  $n$  for which the system never enters into deadlock is
- (a) 3                      (b) 4                      (c) 6                      (d) 5
51. An Internet Service Provider (ISP) has following chunk of CIDR-based IP addresses available with it : 245.248.128.0/20. The ISP wants to give half of this chunk of addresses to organization A and a quarter to organization B while retaining the remaining with itself. Which of the following is a valid allocation of addresses to A and B ?
- (a) 245.248.128.0/21 and 245.248.128.0/22    (b) 245.248.132.0/22 and 245.248.132.0/21  
(c) 245.248.136.0/24 and 245.248.132.0/21    (d) 245.248.136.0/21 and 245.248.128.0/22
52. Dirty bit is used to show the
- (a) wrong page                      (b) page that is modified after being loaded into cache memory  
(c) page with low frequency occurrence                      (d) page with corrupted data
53. Which of the following statement/s is/are true ?
- (i) Firewalls can screen traffic going into or out of an organization.  
(ii) Virtual private networks can simulate an old leased network to provide certain desirable properties.  
Choose the correct answer from the code given below :
- (a) (i) only                      (b) Neither (i) nor (ii)    (c) Both (i) and (ii)    (d) (ii) only
54. A host is connected to network which is part of a university network. The university network, in turn, is part of the internet. The largest network, in which the Ethernet address of the host is unique, is
- (a) the department network                      (b) the internet  
(c) the subnet to which the host belongs                      (d) the university network
55. The third generation mobile phones are digital and based on
- (a) CDMA                      (b) D-AMPS  
(c) Broadband CDMA                      (d) AMPS
56. Consider the following two statements :
- S1: TCP handles both congestion and flow control.  
S2: UDP handles congestion but not flow control.  
Which of the following options is correct with respect to the above statements (S1) and (S2) ?
- (a) Both S1 and S2 are correct                      (b) Neither S1 nor S2 is correct  
(c) S1 is correct but S2 is not correct                      (d) S1 is not correct but S2 is correct
57. Data warehouse contains \_\_\_\_\_ data that is never found in operational environment.
- (a) Encrypted                      (b) Summary                      (c) Scripted                      (d) Encoded

58. Which of the following statements is/are FALSE ?

P: The clean-room strategy to software engineering is based on the incremental software process model.

Q: The clean-room strategy to software engineering is one of the ways to overcome “unconscious” copying of copyrighted code.

Choose the correct answer from the code given below :

Codes :

- (a) Both P and Q      (b) P only      (c) Neither P nor Q      (d) Q only

59. Match each UML diagram in List-I to its appropriate description in List-II.

**List-I**

- A. State diagram  
B. Use-Case diagram  
C. Class diagram  
D. Activity diagram

**List-II**

1. Describes how the external entities (people, devices) can interact with the system.
2. Used to describe the static or structural view of a system.
3. Used to show the flow of a business process, the steps of a use-case or the logic of an object behaviour.
4. Used to describe the dynamic behaviour of objects and could also be used to describe the entire system behaviour.

Codes:

- (a) A-1, B-4, C-3, D-2      (b) A-4, B-1, C-2, D-3  
(c) A-1, B-4, C-2, D-3      (d) A-4, B-2, C-1, D-3

60. Match List-I with List-II and choose the correct answer from the code given below :

**List-I**

- A. Greedy best first search  
B. A\* search  
C. Recursive best first search  
D. Iterative-deepening A\* search

**List-II**

1. Selects a node for expansion if optimal path to that node has been found.
2. Avoids substantial overhead associated with keeping the sorted queue of nodes.
3. Suffers from excessive node generation.
4. Time complexity depends on the quality of heuristic.

Codes:

- (a) A-4, B-3, C-2, D-1      (b) A-1, B-4, C-3, D-2  
(c) A-1, B-2, C-3, D-4      (d) A-4, B-1, C-2, D-3

61. Consider the C/C++ function f(.) given below :

```
void f(char w[])
{
 int x = strlen(w); //length of a string
 char c;
 for (int i = 0; i < x; i++)
 {
 c = w[i];
 w[i] = w[x - i - 1];
 w[x - i - 1] = c;
 }
}
```

Which of the following is the purpose of f(.) ?

- (a) It outputs the contents of the array in reverse order.  
(b) It outputs the contents of the array with the characters shifted over by one position.  
(c) It outputs the contents of the array with the characters rearranged so they are no longer recognized as the words in the original phrase.  
(d) It outputs the contents of the array in the original order.

62. A legacy software system has 940 modules. The latest release required that 90 of these modules be changed. In addition, 40 new modules were added and 12 old modules were removed. Compute the software maturity index for the system.  
 (a) 0.524 (b) 0.725 (c) 0.923 (d) 0.849

63. Consider the following tables (relations):

| Students       |        | Performance    |                  |       |
|----------------|--------|----------------|------------------|-------|
| <u>Roll-No</u> | Name   | <u>Roll-No</u> | <u>Course</u>    | Marks |
| 18CS101        | Ramesh | 18CS101        | DBMS             | 60    |
| 18CS102        | Mukesh | 18CS101        | Compiler design  | 65    |
| 18CS103        | Ramesh | 18CS102        | DBMS             | 80    |
|                |        | 18CS103        | DBMS             | 85    |
|                |        | 18CS102        | Compiler design  | 75    |
|                |        | 18CS103        | Operating system | 70    |

Primary keys in the table are shown using underline. Now, consider the following query :

```
SELECT S.Name, Sum (P.Marks)
FROM Students S, Performance P
WHERE S.Roll-No = P.Roll-No
GROUP BY S.Name
```

The number of rows returned by above query is

- (a) 1 (b) 0 (c) 3 (d) 2
64. In computers, subtraction is generally carried out by  
 (a) 10's complement (b) 1's complement (c) 2's complement (d) 9's complement
65. Which of the following is not one of the principles of agile software development method ?  
 (a) Customer involvement (b) Embrace change  
 (c) Incremental delivery (d) Following the plan
66. Suppose P, Q and R are co-operating processes satisfying mutual exclusion condition. Then, if the process Q is executing in its critical section then  
 (a) 'R' executes in critical section (b) Neither 'P' nor 'R' executes in their critical section.  
 (c) Both 'P' and 'R' execute in critical section. (d) 'P' executes in critical section.
67. Consider the midpoint (or Bresenham) algorithm for rasterizing lines given below :
- (1) Input  $(x_1, y_1)$  and  $(x_2, y_2)$
  - (2)  $y = y_1$
  - (3)  $d = f(x_1 + 1, y_1 + 1/2) // f$  is the implicit form of a line
  - (4) for  $x = x_1$  to  $x_2$
  - (5) do
  - (6) plot(x, y)
  - (7) if( $d < 0$ )
  - (8) then
  - (9)  $y = y + 1$
  - (10)  $d = d + (y_1 - y_2) + (x_2 - x_1)$
  - (11) else
  - (12)  $d = d + (y_1 - y_2)$
  - (13) end
  - (14) end

Which statements are TRUE ?



P: For a line with slope  $m > 1$ , we should change the outer loop in line (4) to be over  $y$ .

Q: Lines (10) and (12) update the decision variable  $d$  through an incremental evaluation of the line equation  $f$ .

R: The algorithm fails if  $d$  is ever 0.

Choose the correct answer from the code given below :

- (a) Q and R only      (b) P, Q and R      (c) P only      (d) P and Q only

68. In 3D graphics, which of the following statements is/are TRUE ?

P: Back-face culling is an example of an image-precision visible-surface determination procedure.

Q: Z-buffer is a 16-bit, 32-bit, or 64-bit field associated with each pixel in a frame buffer that can be used to determine the visible surfaces at each pixel.

Choose the correct answer from the code given below:

Codes:

- (a) Neither P nor Q      (b) Q only      (c) P only      (d) P and Q

69. Which of the following statements are TRUE ?

(i) Every logic network is equivalent to one using just NAND gates or just NOR gates.

(ii) Boolean expressions and logic networks corresponds to labelled acyclic digraphs.

(iii) No two Boolean algebras with  $n$  atoms are isomorphic.

(iv) Non-zero elements of finite Boolean algebra are not uniquely expressible as joins of atoms.

Choose the correct answer from the code given below :

- (a) (i), (ii) and (iii) only      (b) (ii), (iii) and (iv) only  
(c) (i) and (ii) only      (d) (i) and (iv) only

70. In PERT/CPM, the merge event represents \_\_\_\_\_ of two or more events.

- (a) beginning      (b) splitting      (c) joining      (d) completion

71. Software products need perfective maintenance for which of the following reasons ?

(a) To overcome wear and tear caused by the repeated use of the software.

(b) To rectify bugs observed while the system is in use.

(c) To support the new features that users want it to support.

(d) When the customers need the product to run on new platforms.

72. Suppose that everyone in a group of  $N$  people wants to communicate secretly with  $(N - 1)$  other people using symmetric key cryptographic system. The communication between any two persons should not be decodable by the others in the group. The number of keys required in the system as a whole to satisfy the confidentiality requirement is

- (a)  $(N - 1)^2$       (b)  $2N$       (c)  $N(N - 1)$       (d)  $N(N - 1)/2$

73. Consider the following method :

```
int f(int m, int n, boolean x, boolean y)
{
 int res = 0;
 if (m < 0) {res = n - m;}
 else if (x || y)
 {
 res = -1;
 if (n == m) {res = 1;}
 }
 else {res = n;}
 return res;
} /* end of f */
```

If  $P$  is the minimum number of tests to achieve full statement coverage for  $f()$ , and  $Q$  is the minimum number of tests to achieve full branch coverage for  $f()$ , then  $(P, Q) =$

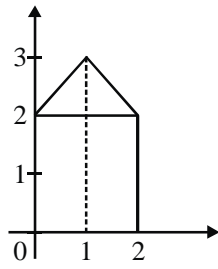
- (a) (2, 3)      (b) (4, 3)      (c) (3, 2)      (d) (3, 4)

74. The solution of recurrence relation  $T(n) = 2T(\sqrt{n}) + \log(n)$  is  
 (a)  $O(n \log n)$  (b)  $O(\log n \log n)$   
 (c)  $O(\log n \log(\log n))$  (d)  $O(\log n)$
75. In Linux operating system environment \_\_\_\_\_ command is used to print a file.  
 (a) lpr (b) print (c) ptr (d) pr
76. In a ternary tree, the number of internal nodes of degree 1, 2 and 3 is 4, 3 and 3 respectively. The number of leaf nodes in the ternary tree is  
 (a) 9 (b) 12 (c) 10 (d) 11
77. Which of the following statements is/are TRUE ?  
 P: Software Reengineering is preferable for software products having high failure rates, having poor design and/or having poor code structure.  
 Q: Software Reverse Engineering is the process of analyzing software with the objective of recovering its design and requirements specification.  
 Choose the correct answer from the code given below :  
 Codes :  
 (a) Both P and Q (b) Q only (c) Neither P nor Q (d) P only
78. \_\_\_\_\_ command is used to remove a relation from an SQL database.  
 (a) Remove table (b) Delete table (c) Drop table (d) Update table
79. Consider the following problems:  
 (i) Whether a finite state automation halts on all inputs ?  
 (ii) Whether a given context free language is regular ?  
 (iii) Whether a Turing machine computes the product of two numbers ?  
 Which one of the following is correct ?  
 (a) Only (ii) and (iii) are undecidable problems.  
 (b) (i), (ii) and (iii) are undecidable problems.  
 (c) Only (i) and (ii) are undecidable problems.  
 (d) Only (i) and (iii) are undecidable problems.
80. A survey has been conducted methods of commuter travel. Each respondent was asked to check Bus, Train or Automobile as a major method of travelling to work. More than one answer was permitted. The results reported were as follows :  
 Bus 30 people; Train 35 people; Automobile 100 people; Bus and Train 15 people; Bus and Automobile 15 people, Train and Automobile 20 people; all the three methods 5 people. How many people completed the survey form ?  
 (a) 160 (b) 120 (c) 115 (d) 165
81. Identify the correct sequence in which the following packets are transmitted on the network by a host when a browser requests a webpage from a remote server, assuming that the host has just been restarted.  
 (a) TCP SYN, DNS query, HTTP GET request  
 (b) DNS query, HTTP GET request, TCP SYN  
 (c) HTTP GET request, DNS query, TCP SYN  
 (d) DNS query, TCP SYN, HTTP GET request
82. Which of the following HTML5 codes will affect the horizontal as well as vertical alignment of the table content?  
 (a) `<td style="text-align : center; vertical-align : middle;"> BASH </td>`  
 (b) `<td style="horizontal-align : center; vertical-align : middle;"> BASH </td>`  
 (c) `<td halign="middle" valign="center"> BASH </td>`  
 (d) `<td align="middle" valign="center"> BASH </td>`

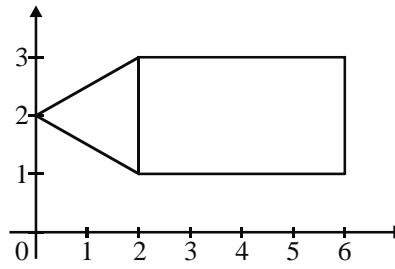
83. The Boolean expression  $\bar{A} \cdot B + A \cdot \bar{B} + A \cdot B$  is equivalent to  
 (a)  $\overline{A+B}$  (b)  $A+B$  (c)  $A \cdot B$  (d)  $\bar{A} \cdot B$
84. Consider the following statements related to AND-OR Search algorithm.  
 S1: A solution is a subtree that has a goal node at every leaf.  
 S2: OR nodes are analogous to the branching in a deterministic environment.  
 S3: AND nodes are analogous to the branching in a non-deterministic environment.  
 Which one of the following is true referencing the above statements ?  
 Choose the correct answer from the code given below:  
 Codes:  
 (a) S1-True, S2-True, S3-False (b) S1-True, S2-True, S3-True  
 (c) S1-False, S2-True, S3-False (d) S1-False, S2-True, S3-True
85. Consider the language L given by  
 $L = \{2^{nk} \mid k > 0, \text{ and } n \text{ is non-negative integer number}\}$   
 The minimum number of states of finite automaton which accepts the language L is  
 (a)  $n+1$  (b)  $\frac{n(n+1)}{2}$  (c)  $n$  (d)  $2^n$
86. The second smallest of n elements can be found with \_\_\_\_\_ comparisons in the worst case.  
 (a)  $\log n$  (b)  $n-1$  (c)  $n + \text{ceil}(\log n) - 2$  (d)  $3n/2$
87. Consider a vocabulary with only four propositions A, B, C and D. How many models are there for the following sentence ?  
 $\neg A \vee \neg B \vee \neg C \vee \neg D$   
 (a) 7 (b) 16 (c) 15 (d) 8
88. Software coupling involves dependencies among pieces of software called modules. Which of the following are correct statements with respect to module coupling ?  
 P: Common coupling occurs when two modules share the same global data.  
 Q: Control coupling occurs when modules share a composite data structure and use only parts of it.  
 R: Content coupling occurs when one modifies or relies on the internal working of another module.  
 Choose the correct answer from the code given below:  
 (a) P and Q only (b) All of P, Q and R (c) Q and R only (d) P and R only
89. Consider the following statements :  
 S1: A heuristic is admissible if it never overestimates the cost to reach the goal.  
 S2: A heuristic is monotonous if it follows triangle inequality property.  
 Which one of the following is TRUE referencing the above statements ?  
 Choose the correct answer from the code given below:  
 (a) Neither of the statements S1 and S2 are true.  
 (b) Both the statements S1 and S2 are true.  
 (c) Statement S1 is false, but statement S2 is true.  
 (d) Statement S1 is true, but statement S2 is false.
90. Consider the following languages :  
 $L_1 = \{a^{n+m} b^n a^m \mid n, m \geq 0\}$   
 $L_2 = \{a^{n+m} b^{n+m} a^{n+m} \mid n, m \geq 0\}$   
 Which one of the following is correct ?  
 (a) Both  $L_1$  and  $L_2$  are context free languages (b) Both  $L_1$  and  $L_2$  are not context free languages  
 (c) Only  $L_1$  is context free language (d) Only  $L_2$  is context free language

91. Consider the following sequence of two transactions on a bank account (A) with initial balance 20,000 that transfers 5,000 to another account (B) and then apply 10% interest.
- (i) T1 start (ii) T1 A old = 20,000 new 15,000  
 (iii) T1 B old = 12,000 new = 17,000 (iv) T1 commit  
 (v) T2 start (vi) T2 A old = 15,000 new = 16,500  
 (vii) T2 commit
- Suppose the database system crashes just before log record log (vii) is written. When the system is restarted, which one statement is true of the recovery process ?
- (a) We must redo log record (vi) to set A to 16,500 and then redo log records (ii) and (iii).  
 (b) We need not redo log records (ii) and (iii) because transaction T1 has committed.  
 (c) We must redo log record (vi) to set A to 16,500.  
 (d) We can apply redo and undo operations in arbitrary order because they are idempotent.
92. Consider the following grammar G :
- $S \rightarrow A \mid B; A \rightarrow a \mid c; B \rightarrow b \mid c$
- where  $\{S, A, B\}$  is the set of non-terminals,  $\{a, b, c\}$  is the set of terminals.  
 Which of the following statement(s) is/are correct ?  
 S1: LR(1) can parse all strings that are generated using grammar G.  
 S2: LL(1) can parse all strings that are generated using grammar G.  
 Choose the correct answer from the code given below :
- Codes:  
 (a) Only S2 (b) Neither S1 nor S2 (c) Only S1 (d) Both S1 and S2
93. Consider ISO-OSI network architecture reference model. Session layer of this model offers dialog control, token management and \_\_\_\_\_ as services.
- (a) Asynchronization (b) Synchronization (c) Errors (d) Flow control
94. Which of the following statement(s) is/are true ?
- (i) Facebook has the world's largest Hadoop Cluster.  
 (ii) Hadoop 2.0 allows live stream processing of real time data.  
 Choose the correct answer from the code given below:
- Codes:  
 (a) Both (i) and (ii) (b) (i) only (c) Neither (i) nor (ii) (d) (ii) only
95. Consider two sequences X and Y :
- $X = \langle 0, 1, 2, 1, 3, 0, 1 \rangle$   
 $Y = \langle 1, 3, 2, 0, 1, 0 \rangle$
- The length of longest common subsequence between X and Y is
- (a) 5 (b) 4 (c) 3 (d) 2
96. \_\_\_\_\_ system call creates new process in Unix.
- (a) Create (b) Fork (c) Fork new (d) Create new
97. Consider the following postfix expression with single digit operands :
- $6\ 2\ 3\ * / 4\ 2\ * + 6\ 8\ * -$
- The top two elements of the stack after the second \* is evaluated, are :
- (a) 6, 2 (b) 6, 3 (c) 8, 2 (d) 8, 1
98. Data scrubbing is
- (a) a process to upgrade the quality of data after it is moved into a data warehouse.  
 (b) a process to upgrade the quality of data before it is moved into a data warehouse.  
 (c) a process to reject data from the data warehouse and to create the necessary indexes.  
 (d) a process to load the data in the data warehouse and to create the necessary indexes.

99. The Software Requirement Specification (SRS) is said to be \_\_\_\_\_ if and only if no subset of individual requirements described in it conflict with each other.  
 (a) verifiable (b) correct (c) unambiguous (d) consistent
100. Which homogeneous 2D matrix transforms the figure (A) on the left side to the figure (B) on the right ?



(A)



(B)

(a)  $\begin{pmatrix} 0 & 2 & 6 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

(b)  $\begin{pmatrix} 0 & 2 & -6 \\ 2 & 0 & 1 \\ 0 & 0 & -1 \end{pmatrix}$

(c)  $\begin{pmatrix} 0 & -2 & 6 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

(d)  $\begin{pmatrix} 1 & -2 & 6 \\ 1 & 0 & 2 \\ 0 & 0 & 1 \end{pmatrix}$

