EXAMINATION QUESTION BOOKLET

321061

Duration: 90 minutes

Test Booklet Series: A

Roll No.:

Answer Sheet No

Name of Candidate_____

Signature of candidate_____

<table>
<tr><th>उम्मीदवारों के लिए निर्देश</th><th>Instructions for Candidate</th></tr>
<tr><td>इस प्रश्न-पुस्तिका में 85 बहुविकल्पीय प्रश्न है।प्रत्येक प्रश्न के चार विकल्प दिए गए है (A),(B),(C) और (D)। प्रत्येक प्रश्न का केवल एक सही विकल्प है। सही विकल्प का चुनाव करे और प्रश्न के सामने वाले सही गोले को उत्तर पुस्तिका में काला करें।</td><td>This booklet consists of 85 Multiple choice questions. Each question has 4 (four) alternatives (A), (B), (C), and (D). In any case only one alternative will be the correct answer. Choose the right alternative and darken the appropriate circle in the answer sheet in front of the related question.</td></tr>
<tr><td>प्रत्येक सही उत्तर के लिए 1अंक दिया जाएगा, गलत देने पर 0.25 अंक काट लिया जाएगा।</td><td>For each correct answer One mark will be given and **for each incorrect answer 0.25 mark will be deducted.**</td></tr>
<tr><td>उम्मीदवार के पास इलेक्ट्रानिक्स एवं कम्युनिकेशन इंजीनियरिंग भाग अथवा कम्प्यूटर साइंस एवं सूचना प्रौद्योगिकी भाग में से किसी एक भाग को हल करने का विकल्प है। ओ.एम. आर. उत्तर पुस्तिका में चुने गए विकल्प के सामने वाले गोले को काला करना अनिवार्य हैं।</td><td>Candidate has choice to attempt either Electronics and Communication Engineering Part OR Computer Science and Information Technology Part. The choice attempted should be marked by darkening the correct circle on OMR answer sheet.</td></tr>
<tr><td>गोले को काला करने के लिए केवल काले/नीले बॉल प्वाइंट पेन का प्रयोग करें। गोले को एक बार काला करने के बाद इसको मिटाना या बदलना नहीं है। किसी प्रश्न का एक से ज्यादा गोले काले करने पर मशीन द्वारा इसके लिए **शून्य अंक** दिया जाएगा।</td><td>Use Black/Blue ball point Pen to darken the circle..Answer once darkened is not allowed to be erased or altered. Against any question if more than one circle is darkened, machine will allot **zero mark** for that question.</td></tr>
<tr><td>ओएमआर उत्तर पुस्तिका में सभी जानकारी देते हुए सही गोले को काला करे। दिए गए निर्देशों के अनुसार आप सही गोले को काला करने में असफल रहते है तो आपके उत्तर पुस्तिका की जाँच नहीं की जाएगी।</td><td>In OMR answer sheet candidate must fill up all required information and for this candidate must darken the appropriate circle. The OMR Answer sheet will not be evaluated if the candidate fails to fill up the required circles correctly as per the given directions.</td></tr>
<tr><td>उत्तर-पुस्तिका में सूचनाओं को भरने से पहले, उत्तर-पुस्तिका में दिए गए निर्देशों को ध्यानपूर्वक पढ़िए। उत्तर-पुस्तिका को किसी भी तरह से न मोड़े।</td><td>Read the instructions printed on Answer sheet carefully before filling the information on the Answer sheet. Do not fold answer sheet in any case.</td></tr>
<tr><td>प्रश्नो का उत्तर देने से पहले यह जाँच कर लें कि उत्तर-पुस्तिका और प्रश्न-पुस्तिका में आपने सारी जानकारी भर दी है।</td><td>Before beginning to answer the questions please make sure that all entries on OMR answer-sheet and Test Question booklet have been duly completed.</td></tr>
<tr><td>परीक्षार्थी अपनी उत्तर पुस्तिका पत्र निरीक्षक को सौंपे बिना परीक्षा हाल नहीं छोड़ सकता हैं और उपस्थिती पत्रिका पर हस्ताक्षर करना अनिवार्य हैं। ऐसा नही करने पर अयोग्य घोषित कर दिया जाएगा।</td><td>**Candidate should not leave the examination hall/room without handing over his Answer sheet to the invigilator and without signing on the attendance sheet. Failing in doing so, will amount to disqualification.**</td></tr>
<tr><td>प्रश्न-पुस्तिका को खोलने के निर्देश मिलने के पश्चात एवं उत्तर देने से पहले उम्मीदवार यह जाँच कर ले कि प्रश्न-पुस्तिका पूर्ण है।</td><td>After receiving the instruction to open the booklet and before answering the questions, the candidate should ensure that the Question booklet is complete.</td></tr>
</table>

नोट : परीक्षा पुस्तिका के हिन्दी संस्करण में यदि कोई विसंगति पाई जाती है, तो अँग्रेजी संस्करण मान्य होगा ।

Note : In case of discrepancy in Hindi language, English version will be treated as final.

जब तक आपसे कहा न जाए तब तक प्रश्न-पुस्तिका न खोलें।

DO NOT OPEN THE QUESTION BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Section A – General Aptitude

Directions : Choose the most appropriate option.

1. कप : होंठ : : पक्षी : ?
   - (A) झाड़ियां
   - (B) घास
   - (C) जंगल
   - (D) चोंच

   CUP : LIP :: BIRD : ?
   - (A) BUSH
   - (B) GRASS
   - (C) FOREST
   - (D) BEAK

2. बहाव : नदी : : रुका हुआ पानी : ?
   - (A) बारिश
   - (B) नदी
   - (C) ताल
   - (D) नहर

   Flow : River :: Stagnant : ?
   - (A) Rain
   - (B) Stream
   - (C) Pool
   - (D) Canal

3. पंजा : बिल्ली : : खुर : ?
   - (A) भेड़
   - (B) हाथी
   - (C) शेर
   - (D) घोड़ा

   Paw : Cat :: Hoof : ?
   - (A) Lamb
   - (B) Elephant
   - (C) Lion
   - (D) Horse

4. पक्षी वैज्ञानिक : पक्षी : : पुरातत्वविद् : ?
   - (A) द्वीप समूह
   - (B) मध्यस्थ
   - (C) पुरातत्व विज्ञान
   - (D) जलीय

   Ornithologist : Bird :: Archealogist : ?
   - (A) Islands
   - (B) Mediators
   - (C) Archealogy
   - (D) Aquatic

5. इस क्रम में गलत संख्या का पता लगाएं।
   125, 127, 130, 135, 142, 153, 165
   - (A) 130
   - (B) 142
   - (C) 153
   - (D) 165

   Find the wrong number in the sequence
   125, 127, 130, 135, 142, 153, 165
   - (A) 130
   - (B) 142
   - (C) 153
   - (D) 165

6. इस श्रृंखला को देखें : 4, 7, 5, 8, 6, 9, ..., ... अगली संख्या कौन सी आनी चाहिए ?
   - (A) 7
   - (B) 9
   - (C) 10
   - (D) 13

   Have a look at the series: 4, 7, 5, 8, 6, 9, ..., ...
   What number should come next?
   - (A) 7
   - (B) 9
   - (C) 10
   - (D) 13

7. इस श्रृंखला को देखें : 26, 24, 20, 18, 14, ... अगली संख्या कौन सी आनी चाहिए ?
   - (A) 10
   - (B) 12
   - (C) 13
   - (D) 16

   Have a look at the series: 26, 24, 20, 18, 14, ...
   What number should come next?
   - (A) 10
   - (B) 12
   - (C) 13
   - (D) 16

8. विंसेंट का अखबार देने का एक मार्ग है। हर सुबह यह अपने आस पास ग्राहकों को 37 समाचार पत्र देता है। विंसेंट को सभी अखबार देने में 50 मिनट का समय लगता है। यदि विंसेंट बीमार है या उसे कोई और काम करना है तो उसका दोस्त थॉमस, जो उसी सड़क पर रहता है, उसकी मदद के लिए अखबार बांटेगा। दी गई जानकारी के अनुसार कौन सा कथन सत्य हो सकता है ?
   - (A) विंसेंट और थॉमस आस पास रहते हैं।
   - (B) थॉमस को अखबार देने में 50 मिनट से अधिक समय लगता है।
   - (C) जब विंसेंट अखबार देना शुरू करता तो बाहर अंधेरा होता है।
   - (D) थॉमस भी भी चाहेगा की उसका अपना अखबार देने का मार्ग हो ।

   Vincent has a paper route. Each morning, he delivers 37 newspapers to customers in his neighbourhood. It takes Vincent 50 minutes to deliver all the papers. If Vincent is sick or has other plans, his friend Thomas, who lives on the same street, will sometimes deliver the papers for him. Given the information presented, which statement that could be considered true?
   - (A) Vincent and Thomas live in the same neighbourhood.
   - (B) It takes Thomas more than 50 minutes to deliver the papers.
   - (C) It is dark outside when Vincent begins his deliveries.
   - (D) Thomas would like to have his own paper route.

9. पैसेफिक यू एक सदाबहार पेड़ है जो प्रशांत उत्तर पश्चिम में उगता है। पैसेफिक यू में एक गूदेदार जहरीला फल लगता है। हाल ही में पैसेफिक यू की छाल में टैक्सॉल नामक एक पदार्थ पाया गया जो कैंसर के इलाज की एक नई आशाजनक दवा के रूप में खोजा गया है। दी जानकारी के अनुसार इसमें से कौन सा कथन सही प्रतीत होता है ?

(A) टैक्सॉल स्वस्थ लोगों द्वारा लेने पर जहरीला होता है।
(B) टैक्सॉल लोगों के कई रोग ठीक करता है।
(C) लोगों को पैसेफिक यू का फल नहीं खाना चाहिए।
(D) पैसेफिक यू को टैक्सॉल की खोज होने तक बेकार माना जाता था।

The Pacific yew is an evergreen tree that grows in the Pacific Northwest. The Pacific yew has a fleshy, poisonous fruit. Recently, taxol, a substance found in the bark of the Pacific yew, was discovered to be a promising new anticancer drug. Given the information presented, which statement that could be considered true?

(A) Taxol is poisonous when taken by healthy people.
(B) Taxol has cured people from various diseases.
(C) People should not eat the fruit of the Pacific yew.
(D) The Pacific yew was considered worthless until taxol was discovered.

10. ऐरिन 12 साल की है। पिछले 3 सालों से वह अपने माता पिता को कुत्ता पालने के लिए कह रही है। उसके माता पिता ने कहा है कि उनका मानना है कि अपार्टमेंट में कुत्ता खुश नहीं रहेगा, किंतु फिर उसके माता पिता ने एक पक्षी पालने की अनुमति दे दी। ऐरिन ने यह तय नहीं किया है कि उसे कौन सा पक्षी पालना चाहिए। दी गई जानकारी के अनुसार कौन सा कथन सत्य हो सकता है ?

(A) ऐरिन के माता पिता कुत्ते की अपेक्षा पक्षी को अधिक पसंद करते हैं।
(B) ऐरिन के माता पिता पक्षी को पसंद नहीं करते हैं।
(C) ऐरिन और उसके माता पिता अपार्टमेंट में रहते हैं।
(D) ऐरिन और उसके माता पिता कहीं और जाना चाहते हैं।

Erin is twelve years old. For three years, she has been asking her parents for a dog. Her parents have told her that they believe a dog would not be happy in an apartment, but they have given her permission to have a bird. Erin has not yet decided what kind of bird she would like to have. Given the information presented, which statement that could be considered true?

(A) Erin's parents like birds better than they like dogs.
(B) Erin does not like birds.
(C) Erin and her parents live in an apartment.
(D) Erin and her parents would like to move.

11. इस श्रृंखला को देखें : 2, 1, (1/2), (1/4), ... अगली संख्या कौन सी आनी चाहिए ?

(A) (1/3)   (B) (1/8)
(C) (2/8)   (D) (1/16)

Have a look at the series: 2, 1, (1/2), (1/4), ... What number should come next?

(A) (1/3)   (B) (1/8)
(C) (2/8)   (D) (1/16)

12. कथन : शहर के वार्ड एक्स में रहने वाले बहुत सारे लोगों को घातक प्रकार के मलेरिया के होने का निदान किया गया है।

कार्यवाही :
I. शहर के नगर निगम प्राधिकारी को तुरंत वार्ड एक्स में बड़े पैमाने पर प्यूमीगेशन के कदम उठाने चाहिए।
II. इस इलाके के लोगों को सलाह दी जानी चाहिए कि वे मच्छरों के काटने से बचें।

(A) केवल I पालन करता ह
(B) केवल II पालन करता है
(C) या तो I या II पालन करना ह
(D) I और II दोनों पालन करते है

Statement: A large number of people in ward X of the city are diagnosed to be suffering from a fatal malaria type.

Courses of Action:
I. The city municipal authority should take immediate steps to carry out extensive fumigation in ward X.
II. The people in the area should be advised to take steps to avoid mosquito bites.

(A) Only I follows
(B) Only II follows
(C) Either I or II follows
(D) Both I and II follows

ROUGH WORK SPACE:

13. कथन : देश के कई हिस्सों में गंभीर सूखा आने की रिपोर्ट की गई है।

कार्यवाही :

I. सरकार को प्रभावित इलाकों के लिए वित्तीय सहायता प्रदान करने की व्यवस्था तुरंत करनी चाहिए।

II. लोगों तथा मवेशियों को बचाने के लिए इन सभी इलाकों में भोजन, पानी और चारा तुरंत भेजा जाना चाहिए।

(A) केवल I पालन करता ह

(B) केवल II पालन करता है

(C) या तो I या II पालन करता ह

(D) न तो I और ना ही II पालन करता है

Statement: Severe drought is reported to have set in several parts of the country.

Courses of Action:

I. Government should immediately make arrangement for providing financial assistance to those affected.

II. Food, water and fodder should immediately be sent to all these areas to save the people and cattle.

(A) Only I follows

(B) Only II follows

(C) Either I or II follows

(D) Neither I nor II follows

Section B – Engineering Mathematics

14. The number of ways to cut a six sided convex polygon whose vertices are labeled into four triangles using diagonal lines that do not cross is

(A) 13   (B) 14

(C) 12   (D) 11

15. The number of ways in which a team of eleven players can be selected from 22 players including 2 of them and excluding 4 of them is

(A) $^{16}C_{11}$ (B) $^{16}C_{5}$

(C) $^{16}C_{9}$ (D) $^{20}C_{9}$

16. Maximum degree of any node in a simple graph with n vertices is

(A) $n-1$ (B) n

(C) $n/2$ (D) $n-2$

17. What is the determinant of the matrix

$$\begin{bmatrix} 5 & 3 & 2 \\ 1 & 2 & 6 \\ 3 & 5 & 10 \end{bmatrix}$$

(A) -76 (B) -28

(C) $+28$ (D) $+72$

18. The greatest and the least value of $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 1$ in $[0, 2]$ are

(A) $0, 8$ (B) $0, -8$

(C) $1, 8$ (D) $1, -8$

19. The system of simultaneous equations

$$x + 2y + z = 6$$
$$2x + y + 2z = 6$$
$$x + y + z = 5$$

has

(A) unique solution

(B) infinite number of solutions

(C) no solution

(D) exactly two solutions

20. In which of the following methods proper choice of initial value is very important?

(A) Bisection method

(B) False position

(C) Newton – Raphson

(D) Bairsto method

21. If $\Delta f(x) = f(x+h) - f(x)$, then a constant k, Δk equals

(A) 1   (B) 0

(C) $f(k) - f(0)$ (D) $f(x + k) - f(x)$

22. The value of the improper integral

$$\int_0^1 x \ln x = ?$$

(A) $1/4$ (B) 0

(C) $-1/4$ (D) 1

23. Maxima and minimum of the function $f(x) = 2x^3 - 15x^2 + 36x + 10$ occur; respectively at

(A) $x = 3$ and $x = 2$

(B) $x = 1$ and $x = 3$

(C) $x = 2$ and $x = 3$

(D) $x = 3$ and $x = 4$

ROUGH WORK SPACE:

24. What is the derivative w.r.t. x of the function given by

$$\Phi(x) = \int_0^{x^2} \sqrt{t} \, dt,$$

(A) $2x^2$ (B) $\sqrt{x}$
(C) 0 (D) 1

25. If A and B are square matrices of size n x n, then which of the following statement is not true?
(A) $\det(AB) = \det(A)\det(B)$
(B) $\det(kA) = k^n \det(A)$
(C) $\det(A + B) = \det(A) + \det(B)$
(D) $\det(A^T) = 1/\det(A^{-1})$

26. $\displaystyle \lim_{x \to 0} \frac{1 - \cos x}{2}$ is equal to
(A) 0 (B) 1
(C) $1/3$ (D) $1/2$

27. The minimum value of $|x^2 - 5x + 2|$ is
(A) -5 (B) 0
(C) -1 (D) -2

28. Differential equation, $\dfrac{d^2x}{dt^2} + 10\dfrac{dx}{dt} + 25x = 0$
will have a solution of the form
(A) $(C_1 + C_2 t)e^{-5t}$ (B) $C_1 e^{-2t}$
(C) $C_1 e^{-5t} + C_2 e^{5t}$ (D) $C_1 e^{-5t} + C_2 e^{2t}$
where C_1 and C_2 are constants.

29. A box contains 10 screws, 3 of which are defective. Two screws are drawn at random with replacement. The probability that none of the two screws is defective will be
(A) 100%
(B) 50%
(C) 49%
(D) None of these

30. Following marks were obtained by the students in a test :
81, 72, 90, 90, 86, 85, 92, 70, 71, 83, 89, 95, 85, 79, 62. Range of the marks is
(A) 9   (B) 17
(C) 27   (D) 33

Directions: Choose the most appropriate option.

31. Which of the following logic expression is incorrect?
(A) $1 \oplus 0 = 1$
(B) $1 \oplus 1 \oplus 0 = 1$
(C) $1 \oplus 1 \oplus 1 = 1$
(D) $1 \oplus 1 = 0$

32. In which of the following adder circuits, the carry look ripple delay is eliminated?
(A) Half adder
(B) Full adder
(C) Parallel adder
(D) Carry-look-ahead adder

33. The output of a sequential circuit depends on
(A) present inputs only
(B) past inputs only
(C) both present and past inputs
(D) present outputs only

34. In a ripple counter using edge triggered JK flip-flops, the pulse input is applied to the
(A) clock input of all flip-flops
(B) clock input of one flip-flops
(C) J and K inputs of all flip-flops
(D) J and K inputs of one flip-flop

35. A decimal number has 30 digits. Approximately, how many digits would the binary representation have?
(A) 30   (B) 60
(C) 90   (D) 120

36. The result of the subtraction $FD_{16} - 88_{16}$ is
(A) 75_{16} (B) 65_{16}
(C) $5E_{16}$ (D) 10_{16}

37. How many RAM chips of size (256 K x 1 bit) are required to build 1M Byte memory?
(A) 8   (B) 10
(C) 24   (D) 32

SC – B – A

38. When we move from the outermost track to the innermost track in a magnetic disk, then density (bits per linear inch)
(A) increases
(B) decreases
(C) remains the same
(D) either remains constant or decreases

39. A certain processor supports only the immediate and the direct addressing modes. Which of the following programming language features cannot be implemented on this processor?
(A) Pointers   (B) Arrays
(C) Records   (D) All of these

40. Disadvantage of dynamic RAM over static RAM is
(A) higher power consumption
(B) variable speed
(C) need to refresh the capacitor charge every once in two milliseconds
(D) higher bit density

41. What is the correct way to round off x, a float, to an int value?
(A) $y = (\text{int}) (x + 0.5)$
(B) $y = \text{int} (x + 0.5)$
(C) $y = (\text{int}) x + 0.5$
(D) $y = (\text{int}) (\text{int}) x + 0.5$

42. Which of the following sorting algorithms does not have a worst case running time of $O(n^2)$?
(A) Insertion sort   (B) Merge sort
(C) Quick sort   (D) Bubble sort

43. What error would the following function given on compilation?
```
f(int a, int b)
{
        int a;
        a = 20;
        return a;
}
```
(A) Missing parentheses is *return* statement
(B) Function should be defined as *int f(int a, int b)*
(C) Redeclaration of *a*
(D) None of these

44. Prior to using a pointer variable it should be
(A) declared
(B) initialized
(C) both declared and initialized
(D) none of these

45. Output of the following loop is
```
for (putchar('c'); putchar
  ('a'); putchar ('r'))
  putchar ('t');
```
(A) a syntax error
(B) cartrt
(C) catrat
(D) catratratratrat…

46. If space occupied by two strings s_1 and s_2 in 'C' are respectively m and n, then space occupied by string obtained by concatenating s_1 and s_2 is always
(A) less than $m + n$
(B) equal to $m + n$
(C) greater than $m + n$
(D) none of these

47. A hash function f defined as f (key) = key mod 7, with linear probing, insert the keys 37, 38, 72, 48, 98, 11, 56, into a table indexed from 11 will be stored in the location
(A) 3   (B) 4
(C) 5   (D) 6

48. Traversing a binary tree first root and then left and right subtrees called _____ traversal.
(A) postorder
(B) preorder
(C) inorder
(D) none of these

49. If there is an NP-complete language L whose complement is in NP, then complement of any language in NP is in
(A) P
(B) NP
(C) both (A) and (B)
(D) none of these

ROUGH WORK SPACE:

50. A hash table has space for 100 records. Then the probability of collision before the table is 10% full, is
(A) 0.45
(B) 0.5
(C) 0.3
(D) 0.34 (approximately)

51. A polynomial p(x) is such that

$p(0) = 5, p(1) = 4, p(2) = 9$ and $p(3) = 20$

The minimum degree it can have is
(A) 1
(B) 2
(C) 3
(D) 4

52. Time complexity of an algorithm T (n), where n is the input size is given by
$$T (n) = T (n - 1) + 1/n, \text{ if } n > 1$$
$$= 1, \text{ otherwise}$$
The order of this algorithm is
(A) log n
(B) n
(C) n^2
(D) n^n

53. If S be an infinite set and S_1 ...., S_n be sets such that $S_1 \cup S_2 \cup ..... \cup S_n = S$, then
(A) atleast one of the set S_i is a finite set
(B) not more than one of the sets S_i can be finite
(C) atleast one of the sets S_i is an infinite set
(D) not more than one of the sets S_i can be infinite

54. Which of the following regular expressions denotes a language comprising all possible strings over the alphabet $\{a, b\}$?
(A) $a* b*$
(B) $(a \mid b) *$
(C) $(ab)^+$
(D) $(a \mid b*)$

55. Regarding power of recognition of language, which of the following statements is false?
(A) Non deterministic finite-state automata are equivalent to deterministic finite-state automata.
(B) Non-deterministic push-down automata are equivalent to deterministic push-down automata.
(C) Non-deterministic Turing Machines are equivalent to deterministic push-down automata
(D) Multi-tape Turing Machines are equivalent to Single-tape Turing Machines

56. If L1 and L2 are context free language and R a regular set, then which one of the languages below is not necessarily a context free language?
(A) $L_1 L_2$
(B) $L_1 \cap L_2$
(C) $L_1 \cap R$
(D) $L_1 \cup L_2$

57. If L be a language recognizable by a finite automation, then language from $\{L\} = \{w$ such that w is prefix of v where $v \in L \}$, is a
(A) regular language
(B) context-free language
(C) context-sensitive language
(D) recursive enumeration language

58. Which of the following statements is correct?
(A) $A = \{a^n b^n \mid n = 0, 1, 2, 3..\}$ is regular language
(B) Set B of all strings of equal number of a's and b's defines a regular language
(C) $L (A* B*) \cap B$ gives the set A
(D) None of these

59. The CFG $s \to as \mid bs \mid a \mid b$ is equivalent to regular expression
(A) $(a + b)$
(B) $(a + b) (a + b) *$
(C) $(a + b) (a + b)$
(D) all of these

60. Bounded minimalization is a technique for
(A) proving whether a promotive recursive function is turning computable or not
(B) proving whether a primitive recursive function is a total function or not
(C) generating primitive recursive functions
(D) generating partial recursive functions

61. In a single pass assembler, most of the forward references can be avoided by putting the restriction
(A) on the number of strings/ lifereacts
(B) that the data segment must be defined after the code segment
(C) on unconditional rump
(D) that the data segment be defined before the code segment

ROUGH WORK SPACE:

SC – B – A

62. A linker is given object module for a set of programs that were compiled separately. What information need not be included in an object module?
(A) Object code
(B) Relocation bits
(C) Names and locations of all external symbols defined in the object module
(D) Absolute addresses of internal symbols

63. In what module multiple instances of execution will yield the same result even if one instance has not terminated before the next one has begun?
(A) Non reusable module
(B) Serially usable
(C) Re-enterable module
(D) Recursive module

64. Global locks
(A) synchronize access to local resources
(B) synchronize access to global resources
(C) are used to avoid local locks
(D) prevent access to global resources

65. The file structure that redefines its first record at a base of zero uses the term
(A) relative organization
(B) key fielding
(C) dynamic reallocation
(D) all of these

66. What is the elapsed time of P if records of F are organized using a blocking factor of 2 (i.e. each block on D contains two records of F) and P uses one buffer?
(A) 12 sec
(B) 14 sec
(C) 17 sec
(D) 21 sec

67. A long-term monitor
(A) should show any immediate performance problems
(B) should show I/O, paging and processor activity
(C) need show only the I/O and processor activity
(D) usually reports only on terminal displays

68. Determine the number of page faults when references to pages occur in the following order: 1, 2, 4, 5, 2, 1, 2, 4. Assume that the main memory can accommodate 3 pages and the main memory already has the pages 1 and 2, with page 1 having been brought earlier than page 2. (LRU algorithm is used)
(A) 3
(B) 5
(C) 4
(D) none of these

69. Working set (t, k) at an instant of time, t, is
(A) the set of k future references that the operating system will make
(B) the set of future references that the operating system will make in the next 'k' time units
(C) the set of k references with high frequency
(D) the set of pages that have been referenced in the last k time units

70. In a relational Schema, each tuple is divided in to fields called
(A) relations
(B) domains
(C) queries
(D) none of these

71. The employee salary should not be greater than Rs. 2000. This is
(A) integrity constraint
(B) referential constraint
(C) over-defined constraint
(D) feasible constraint

72. The relational algebra expression equivalent to the tuple calculus expression $\{t \mid t \in r \wedge (t[A] = 10 \wedge t[B] = 20)\}$ is
(A) $\sigma_{(A = 10 \vee B = 20)} (r)$
(B) $\sigma_{(A = 10)} (r) \cup \sigma_{(B = 20)} (r)$
(C) $\sigma_{(A = 10)} (r) \cap \sigma_{(B = 20)} (r)$
(D) $\sigma_{(A = 10)} (r) - \sigma_{(B = 20)} (r)$

73. Let R = (A, B, C, D, E, F) be a relation scheme with the following dependencies:
$C \rightarrow F, E \rightarrow a, EC \rightarrow D, A \rightarrow B$.
Which of the following is a key for R ?
(A) CD
(B) EC
(C) AE
(D) AC

ROUGH WORK SPACE:

74. For a database relation R (*a, b, c, d*), where the domains of *a, b, c*, d include only atomic values, only the following functional dependencies and those that that can be inferred from them hold:

$a \rightarrow c$

$b \rightarrow d$

the relation is in

(A) first normal form but not in second normal form
(B) second normal form but not in third normal form
(C) third normal form
(D) none of these

75. Control structures include
(A) iteration
(B) rendezvous statements
(C) exception statements
(D) all of these

76. According to Brooks, if *n* is the number of programmers in a project team, then the number of communication path is
(A) n (n-1) / 2   (B) n log n
(C) n   (D) n (n+1) / 2

77. In object oriented design of software, objects have
(A) attributes and name only
(B) operations and name only
(C) attributes name and operations
(D) mutation and permutation property

78. The shell
(A) accepts command from the user
(B) maintains directories of files
(C) translates the keyboard's character codes
(D) none of these

79. The extent to which the software can control to operate correctly despite the introduction of invalid input is called as
(A) reliability   (B) robustness
(C) fault tolerance   (D) portability

80. On an average, the programmer months is given by 3.6 x (KLOC)$^{1.2}$. If so, a project requiring one thousand source instructions will require
(A) 3.6 PM   (B) 0.36 PM
(C) 0.0036 M   (D) 7.23 PM

81. Relation of COCOMO model is
(A) $E = a * (KLOC)^6$
(B) $E = a * (KLOC)^5$
(C) $E = a * (KLOC)^7$
(D) $E = a * (KLOC)^3$

82. Which of the following is possible in a token passing bus network?
(A) in-service expansion
(B) unlimited number of stations
(C) both (A) and (B)
(D) unlimited distance

83. In context of TCP/IP computer network models, which of the following is FALSE?
(A) Besides span of geographical area, the other major difference between LAN and WAN is that the later uses switching element
(B) A repeater is used just to forward bits from one network to another one
(C) IP layer is connected oriented layer in TCP/IP
(D) A gateway is used to connect incompatible networks

84. Which of the following is not a transceiver function?
(A) Transmission and receipt of data
(B) Checking of line voltages
(C) Addition and subtraction of headers
(D) Collision detection

85. A packet-switching network
(A) is free
(B) can reduce the cost of using an information utility
(C) allows communications channel to be shared among more than one user
(D) both (B) and (C)

Directions: Choose the most appropriate option.

31. The value of the capacitance C in the given ac circuit to make it a constant resistance circuit OR for the supply current to be independent of its frequency is
(A) F / 16   (B) F / 12
(C) F / 8   (D) F / 4

32. When a resistor R is connected to a current source, it consumes a power of 18 W. When the same R is connected to a voltage source having the same magnitude as the current source, the power absorbed by R is 4.5 W. The magnitude of the current source and the value of R are
(A) $\sqrt{18}A$ and $1\ \Omega$
(B) 3A and $2\ \Omega$
(C) 1A and $18\ \Omega$
(D) 6A and $0.5\ \Omega$

33. Current I_1, I_2 and I_3 meet at a junction (node) in a circuit. All currents are marked as entering the node. If $I_1 = -6 \sin(\omega t)$ mA and $I_2 = 8 \cos(\omega t)$ mA, then I_3 will be
(A) $10 \cos(\omega t + 36.87)$ mA
(B) $14 \cos(\omega t + 36.87)$ mA
(C) $-14 \sin(\omega t + 36.87)$ mA
(D) $10 \cos(\omega t + 36.87)$ mA

34. Which of the following theorems can be applied to any network-linear or non-linear, active or passive, time-variant or time-invarient?
(A) Thevenin theorem
(B) Norton theorem
(C) Tellegen theorem
(D) Superposition theorem

35. A load that has a resistance of 10 ohms is to be connected to a supply that has a constant voltage of 120 volts. If it is desired that the current to the load be varied from 3 to 5 amperes, what are the resistance and the current rating of the series rheostat that permit this variation?
(A) 30 ohms, 5A   (B) 10 ohms, 10A
(C) 20 ohms, 10A   (D) 20 ohms, 10A

36. A zener diode works on the principle of
(A) tunneling of charge carriers across the junction
(B) thermionic emission
(C) diffusion of charge carriers across the junction
(D) hopping of charge carriers across the junction

37. The static characteristic of an adequately forward biased p-n junction is a straight line, if the plot is of
(A) log I *vs* log V   (B) log I *vs* V
(C) I *vs* log V   (D) I *vs* V

38. Silicon diode is less suited for low voltage rectifier operation, because
(A) it can withstand high temperatures
(B) its reverse saturation current is low
(C) its cut-in voltage is high
(D) its break down voltage is high

39. Avalanche breakdown diodes have breakdown voltage
(A) having positive temperature coefficient
(B) having negative temperature coefficient
(C) independent of temperature
(D) none of these

40. In bipolar transistor biased in the forward-active region base current, $I_B = 50\ \mu A$ and collector currents, $I_C = 2.7$ mA. Then α is
(A) 0.949   (B) 54
(C) 0.982   (D) 0.018

41. Ebers-Moll model is applicable to
(A) bipolar junction transistors
(B) NMOS transistors
(C) unipolar junction transistors
(D) junction field-effect transistors

42. In a differential amplifier, CMRR can be improved by using an increased
(A) emitter resistance
(B) collector resistance
(C) power supply voltages
(D) source resistance

43. From measurement of the rise time of the output pulse of an amplifier whose input is a small amplitude square wave, which of the following parameter of the amplifier can be estimated?
(A) Gain-bandwidth product
(B) Slew rate
(C) Upper 3-dB frequency
(D) Lower 3-dB frequency

44. If differential and common mode gains of a differential amplifier are 50 and 0.2 respectively then CMRR will be
(A) 100 V   (B) 49.8 V
(C) 8.7 V   (D) 10.7 V

45. In a MOSFET, the transfer characteristics can be used to determine which of the following device parameters?
(A) Threshold voltage and output resistance
(B) Trans-conductance and output resistance
(C) Threshold voltage and trans-conductance
(D) Trans-conductance and channel length modulation parameter

46. Consider the following
1. Si   2. Ge
3. GaAs   4. InP
Which of the above semiconductors should be used for making highly efficient photodiodes?
(A) 1 and 4 only   (B) 3 and 4 only
(C) 1, 3 and 4   (D) 2, 3 and 4

47. The MOSFET switch in its on-state may be considered equivalent to
(A) resistor   (B) inductor
(C) capacitor   (D) battery

48. The RMS value of a half-wave rectified symmetrical square wave current of 2 A is
(A) $\sqrt{2}A$ (B) 1 A
(C) $1/\sqrt{2}A$ (D) $\sqrt{3}A$

49. If single stage transformer coupled class A amplifier uses a transistor with maximum dissipation capability of 2.5 watts, then maximum ac power in the load is
(A) 1.25 watts   (B) 2.5 watts
(C) 5.0 watts   (D) 0.65 watts

50. In a class A series fed amplifier using a transistor, under ideal conditions, if maximum ac power delivered is 1 watt, then maximum transistor dissipation capability has to be
(A) 1 watt   (B) 2 watts
(C) 3 watts   (D) 4 watts

51. If an npn transistor (with C = 0.3 pF) has a unity gain cut off frequency f_T of 400 MHz at a d.c. bias current $I_c = 1mA$, then value of its C_μ is approximately ($V_T = 26$ mV)
(A) 15   (B)   30
(C) 50   (D)   96

52. If a two-stage amplifier is required to have an upper cut off frequency of 2 MHz and a lower cut off frequency of 30 Hz then upper and lower cut off frequencies of individual stage are respectively
(A) 4 MHz, 60 Hz   (B) 3 MHz, 20 Hz
(C) 3 MHz, 60 Hz   (D) 4 MHz, 20 Hz

53. A signal may have frequency components which lie in the range of 0.001 Hz to 10 Hz. Which of the following types of coupling should be chosen in a multistage amplifier designed to amplify this signal?
(A) RC coupling
(B) Transformer coupling
(C) Direct coupling
(D) Double-tuned coupling

54. A source follower using an FET usually has a voltage gain which is
(A) greater than + 100
(B) slightly less than unity but positive
(C) exactly unity but negative
(D) about – 10

ROUGH WORK SPACE:

55. In a common emitter amplifier, the unbypassed emitter resistance provides
(A) voltage-shunt feedback
(B) current-series feedback
(C) negative-voltage feedback
(D) positive-current feedback

56. The data-bus width of a 204 x 8 bits is
(A) 8   (B) 10
(C) 12   (D) 16

57. Output voltage of an OPAMP for input voltage of $V_{i1} = 150\ \mu V$, $V_{i2} = 140\ \mu V$ if amplifier has a differential gain of $A_d = 4000$ and value of CMRR is 100, is
(A) 45.8 mV   (B) 40.006 mV
(C) 10 μV   (D) 145 μV

58. A differential amplifier is invariably used in the input stage of all OP-AMP's. This is done basically to provide OP-AMP's with a very high
(A) CMRR   (B) bandwidth
(C) slew rate   (D) open-loop gain

59. For the circuit of the given figure with an ideal operational amplifier, maximum phase shift of the output V_{out} with reference to the input V_{in} is
(A) $0°$ (B) $-90°$
(C) $+90°$ (D) $+180°$

60. Boolean expression for the output of XNOR (Equivalent) logic gate with inputs A and B, is
(A) $A\bar{B} + \bar{A}B$
(B) $\overline{AB} + AB$
(C) $(\bar{A} + B)(A + \bar{B})$
(D) $(\bar{A} + \bar{B})(A + B)$

61. When signed numbers are used in binary arithmetic, then which of the following notations would have unique representation for zero?
(A) Sign-magnitude
(B) 1's complement
(C) 2's complement
(D) 9's complement

62. The logic function $f = \overline{(\bar{x}.y) + (x.\bar{y})}$ is the same as
(A) $f = (x + y)\ (\bar{x} + \bar{y})$
(B) $f = \bar{x}\ \bar{y} + xy$
(C) $f = \overline{(\bar{x}.y).(x.\bar{y})}$
(D) none of these

63. The characteristic equation of the T-FF is given by
(A) $Q^+ = \bar{T}Q + T\bar{Q}$
(B) $Q^+ = T\bar{Q} + Q\bar{T}$
(C) $Q^+ = TQ$
(D) $Q^+ = T\bar{Q}$

64. A pulse train with a frequency of 1 MHz is counted using a modulo 1024 ripple-counter built with J-K flip-flops. For proper operation of the counter the maximum permissible propagation delay per flip-flop stage is
(A) 100 n sec   (B) 50 n sec
(C) 20 n sec   (D) 10 n sec

65. In a 4 bit counter, the outputs of 3 JK FFs from MSB downward are connected to the NAND gate whose output is connected to CLR.
(A) It is a MOD-14 counter
(B) It is a MOD-13 counter
(C) It is a divide by-13 counter
(D) It is a divide by-14 counter

66. Digital multiplexer is basically a combinational logic circuit to perform the operation
(A) AND – AND   (B) OR – OR
(C) AND – OR   (D) OR – AND

67. For a dual ADC type 3 1/2 digit DVM, reference voltage is 100 mV and first integration time is set to 300 ms. For some input voltage, "deintegration" period is 370.2 ms. The DVM will indicate
(A) 123.4   (B) 199.9
(C) 100.0   (D) 1.414

SC – B – A

68. A dual-slope analog-to-digital converter uses an N-bit counter. When input signal V_a is being integrated, then counter is allowed to count up to a value
(A) equal to $2^N - 2$
(B) equal to $2^N - 1$
(C) proportional to V_a
(D) inversely proportional to V_a

69. PROMs are used to store
(A) bulk information
(B) sequential information
(C) information to be accessed rarely
(D) relatively permanent information

70. The unit step error coefficient of a system
$$G(s) = \frac{1}{(s+6)(s+1)}$$
with unity feedback is
(A) 1/6
(B) ∞
(C) 0
(D) 1

71. What is the value of k for a unity feedback system with $G(s) = \dfrac{k}{s(1+s)}$ to have a peak overshoot of 50%?
(A) 0.53
(C) 5.3
(B) 0.6
(D) 0.047

72. Which of the following interrupts are unmaskable interrupts?
(A) RST 5.5
(B) RST 7.5
(C) TRAP
(D) INTR

73. If the HLT instruction of a 8085 micro-processor is executed
(A) The microprocessor is disconnected form the system bus fill the reset is pressed
(B) The microprocessor enters into a halt state and the buses are tri-stated
(C) The microprocessor reloads the program from the locations 0024 and 0025H
(D) The microprocessor halts execution of the program and returns to monitor

74. What is the laplace transform of a delayed unit impulse function $\delta(t - 1)$?
(A) 1
(B) zero
(C) $\exp(-s)$
(D) s

75. The Laplace transform of $f(t) = t$ is given by
(A) s^{-2}
(B) s^{-1}
(C) $2s^{-3}$
(D) s

76. The Z-transform of the time function
$$\sum_{k=0}^{\infty} \delta(n-k) \text{ is}$$
(A) $\dfrac{z-1}{z}$
(B) $\dfrac{z}{(z-1)^2}$
(C) $\dfrac{z}{z-1}$
(D) $\dfrac{(z-1)^2}{z}$

77. For $V(s) = \dfrac{s(s+2)}{s(s+1)}$, the initial and final values of $v(t)$ will be respectively
(A) 1 and 1
(B) 2 and 2
(C) 2 and 1
(D) 1 and 2

78. Given the transform pair
$$x(t)u(t) \xleftrightarrow{L} \frac{2s}{s^2+2}$$
Determine the laplace transform Y(s) of the given time signal in question and choose correct option.
$$y(t) = x(t-2)$$
(A) $\dfrac{2se^{-2s}}{s^2+2}$
(B) $\dfrac{2se^{-2s}}{s^2+2}$
(C) $\dfrac{2(s-2)}{(s-2)^2+1}$
(D) $\dfrac{2(s+2)}{(s+2)^2+1}$

ROUGH WORK SPACE:

79. $y(t) = u(t) * h(t)$, where $h(t) = \begin{cases} e^{2t}, & t < 0 \\ e^{\pm 3t}, & t > 0 \end{cases}$

(A) $\dfrac{1}{2}e^{-2t}u(-t-1) + \dfrac{5}{6} - \dfrac{1}{3}e^{-3t}u(-t)$

(B) $\dfrac{1}{2}e^{2t}u(-t-1) + \dfrac{5}{6} - \dfrac{1}{3}e^{-3t}u(-t)$

(C) $\dfrac{1}{2}e^{2t}t + \dfrac{1}{6}[5 - 3e^{2t} - 2e^{-3t}]u(t)$

(D) $\dfrac{1}{2}e^{2t} + \dfrac{1}{6}[5 - 3e^{2t} - 2e^{-3t}]u(-t)$

80. Energy of the signal $A\delta[n]$ is

(A) A^2

(B) $\dfrac{A^2}{2}$

(C) $\dfrac{A^2}{4}$

(D) 0

81. The Fourier series representation of a periodic current is

$$[2 + 6\sqrt{2}\cos \omega t + \sqrt{48}\sin 2\omega t]A.$$

The effective value of the current is

(A) $(2 + 6 + \sqrt{24})A$ (B) 8A

(C) 6A (D) 2A

82. For even function, the necessary condition is

(A) $f(t) = -f(-t)$

(B) $f(t) = +f(-t)$

(C) $f(t) = \dfrac{1}{f(-t)}$

(D) $f(t) = -(t \pm T/2)$

83. The current $i(t)$ flowing through a resistor R = 10 ohm is

$$i(t) = 5\sin \omega t + 4\sin 3\omega t + 3\sin 5\omega t$$

The average power is

(A) 160 W (B) 250 W

(C) 500 W (D) 720 W

84. A linear time invariant system has an impulse response e^{2t}, $t > 0$. If the initial conditions are zero and the input is e^{3t}, the output for t > 0 is

(A) $e^{3t} - e^{2t}$

(B) e^{5t}

(C) $e^{3t} + e^{2t}$

(D) None of these

85. Laplace transform of $\sin 2t$ is

(A) $\dfrac{4}{s^2 + 2}$ (B) $\dfrac{4}{s^2 + 4}$

(C) $\dfrac{2}{s^2 + 4}$ (D) $\dfrac{2}{s^2 + 2}$

ROUGH WORK SPACE:

SC – B – A