

Instructions:

1. Ensure that all pages are printed
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. Consider following C statements
`int *p;`
`p = (???) malloc(100);`
The ??? Is replaced with which of the following?

A <code>int</code>	B <code>int &</code>
C <code>int *</code>	D <code>int **</code>
2. if a structure inside structure is used in C program, it is called

A nested structure	B recursive structure
C self-referential structure	D Any of the above
3. Which of the following is valid sequence in an array representing 3-ary max-heap?

A 1 3 5 6 8 9	B 9 5 6 8 3 1
C 9 6 3 1 8 5	D None of the above
4. Assume that a string is defined in C with name str, which of the following is valid operation?

A <code>str = "Hello";</code>	B <code>strcpy(str, "Hello");</code>
C <code>str + "Hello";</code>	D All are valid
5. Which of the following specifies is used in C to read number in Hex?

A <code>%x</code>	B <code>%o</code>
C <code>%u</code>	D <code>%h</code>
6. A binary tree is created by inserting following sequence.
6 10 25 12 4 7 15 8 33
Which traversal does following sequence shows?
6 4 10 7 25 8 12 33 15

A Inorder	B Preorder
C Postorder	D Level order

7. What would be output of following?

```
int x, y = 7;  
If (x = y) printf("Hello"); else printf("Fine");
```

A Hello	B Fine
C Compilation error	D HelloFine
 8. No. of nodes at level = 4 in a full binary tree (level of root is 0) are

A 4	B 8
C 16	D 32
 9. The size of long double in ANSI C is

A 4 Bytes	B 8 Bytes
C 10 Bytes	D None of the above
 10. Preorder traversal is same as

A breadth first search	B depth first search
C level order traversal	D None of the above
 11. Which of the following can be used to immediately exit from C program ?

A break	B continue
C exit()	D All of the above
 12. Which of the following is an homogeneous data structure ?

A Array	B Structure
C Union	D None of the above
 13. Which of the following is true for structures and functions ?

A A pointer to a structure can be passed as a function argument	B It is possible to return a structure variable from a function
C The structure variable used in the actual argument and the formal argument must be of the same structure type.	D All of the above
 14. A balance factor in AVL tree is used to check

A Which rotation to perform	B Whether tree is unbalanced
C When last rotation occurred	D Whether all the child nodes are at same level
 15. Which of the following is an application of queue data structure ?

- A Load balancing
B Asynchronous data transfers
C When a resource is shared among multiple consumers
D All of the above

16. If the array is already sorted, which of these algorithms will exhibit the best performance?
A Insertion sort
B Merge sort
C Quick sort
D Heap sort

17. The recurrence relation capturing the optimal time of the Tower of Hanoi problem with n disc is
A $T(n) = 2T(n-2)+2$
B $T(n) = 2T(n-1)+1$
C $T(n) = 2T(n-1)+n$
D $T(n) = 2T(n/2)+1$

18. What is the best time complexity of bubble sort ?
A N^2
B $N \log N$
C N
D $N(\log N)^2$

19. The time factor when determining the efficiency of algorithm is measured by
A Counting microseconds
B Counting the size of the algorithm in Bytes
C Counting the number of statements
D Counting the number of key operations

20. The best case occur in linear search algorithm
A When Item is somewhere in the middle of the array
B When Item is not in the array at all
C When Item is the last element in the array
D None of the above

21. Total Degree of a Triangle is
A 3
B 6
C 9
D 12

22. A sorted array in ascending order is
A MAX Heap
B MIN Heap
C Not a Heap Tree
D None of the above

23. Analyzing algorithm means
A Evaluating the complexity of algorithm only
B Validating the algorithm

- C Both A and B D None of the above

24. Recursive procedures are implemented by using ____ data structure.

A Stack B Queue

C Linked list D All of the above

25. The goal of hashing is to produce a search that takes

A $O(1)$ time B $O(n^2)$ time

C $O(\log n)$ time D $O(n \log n)$ time

26. Which of the following HTML tag is not used for emphasis ?

A ` .. ` B `^{..}`

C `<tt> .. </tt>` D All are used for emphasis

27. Which of the following HTML tag will not be used when frameset is used ?

A `<head>` B `<body>`

C `<title>` D None of the above

28. Which of the following denotes id in case of CSS ?

A `p.right` B `.left { text-align:left }`

C `p#bluepara { ... }` D None of the above

29. What is true about XSLT?

A Uses XPath to navigate XML document B W3C Recommendation

C Transforms the source XML document to another type D All of the above

30. Which of the JavaScript event is useful for form validation ?

A `onSubmit` B `onValidate`

C `doValidate` D Any of the above

31. The binary numbers $A = 1100$ and $B = 1001$ are applied to the inputs of a comparator. What are the output levels?

A $A > B = 1, A < B = 0, A = B = 1$ B $A > B = 0, A < B = 1, A = B = 0$

C $A > B = 1, A < B = 0, A = B = 0$ D $A > B = 0, A < B = 1, A = B = 1$

32. The decimal 8 is represented as _____ using Gray Code.

A 11 B 1100

C 1000 D 1010

33. The main use of the Multiplexer is to
- | | | | |
|---|---|---|---|
| A | Select data from multiple sources and to route it to a single Destination | B | Select data from Single source and to route it to a multiple Destinations |
| C | Select data from Single source and to route to single destination | D | None of the above |
34. ASCII code is a bit code.
- | | | | |
|---|----|---|-------------------|
| A | 7 | B | 8 |
| C | 16 | D | None of the above |
35. A set of Boolean connectives is functionally complete if all Boolean functions can be synthesized using those. Which of the following sets of connectives is NOT functionally complete?
- | | | | |
|---|-----------------------|---|--------------|
| A | Implication, negation | B | OR, negation |
| C | NAND | D | EX-NOR |
36. How many bits are needed to encode 26 alphabets, 10 digits and 10 numerals?
- | | | | |
|---|---|---|---|
| A | 2 | B | 3 |
| C | 5 | D | 6 |
37. The speed imbalance between memory access and CPU operation can be reduced by
- | | | | |
|---|-------------------------------|---|---------------------|
| A | Memory Compaction | B | Memory interleaving |
| C | Increasing the size of memory | D | All of the above |
38. Instructions which are not meant for execution are known as
- | | | | |
|---|---------------------|---|-------------------|
| A | Fake instructions | B | Extra instruction |
| C | Pseudo instructions | D | None of the above |
39. _____ does not hold data but holds the address of data
- | | | | |
|---|----------------------------------|---|------------------------------------|
| A | Pointer, Index, or Base Register | B | Pointer, Segment, or Base Register |
| C | General Registers | D | Instruction Pointer |
40. A microprogramed control unit
- | | | | |
|---|--|---|--|
| A | is faster than a hard wired control unit | B | facilitate easy implementation of new instructions |
| C | is useful when very small programs to be run | D | usually refers to the control unit of a microprocessor |
41. Due to mismatch in speed of sender and receiver, TCP does
- | | | | |
|---|-------------------------------|---|-------------------------------|
| A | Increases speed of slower one | B | Decreases speed of faster one |
|---|-------------------------------|---|-------------------------------|

- C Uses buffers on both the sides D Does not provide any solution
42. A group of networks and router under a single administrative authority is known as
- A Autonomous System B Internet Service Provider
- C Intranet D WAN
43. A subnet mask in class C has 25 1s. How many subnets does it define?
- A 1 B 2
- C 4 D 8
44. ICMP protocol works at Layer.
- A Data Link B Application
- C Transport D Network
45. Which of the following protocol is used by Ethernet to access the media?
- A CDMA B CDMA/CD
- C ALOHA D Slotted ALOHA
46. Which of the following pair represents the socket?
- A IP address, MAC address B IP address, Physical address
- C IP address, Port address D Any one of them
47. Which of the following is not applicable to IP protocol?
- A Best-effort delivery B Datagram service
- C Connection oriented D All are applicable
48. SET is protocol used for
- A Online payment B Confidentiality in e-commerce
- C Both A and B D None of the above
49. The main element of the digital certificate is
- A Public key of the subject B Passport number of the subject
- C Address of the subject D None of the above
50. Why does hacker use the proxy server ?
- A To obtain a remote access B To create a stronger connection with the target.
- C To create a stronger connection with the target D To hide malicious activity on the network

51. Which of the following symmetric key algorithm uses streaming cipher ?
- | | |
|------------|-------|
| A Blowfish | B RC4 |
| C MD5 | D SHA |
52. Which of the following commands is used to perform an Nmap XMAS scan every 15seconds?
- | | |
|------------------------|----------------------|
| A nmap -sX -sneaky | B nmap -sX -paranoid |
| C nmap -sX -aggressive | D None of the above |
53. How is IP address spoofing detected?
- | | |
|--|---|
| A Implementing a firewall to the network | B Identify all TCP sessions that are initiated but does not complete successfully |
| C Comparing the TTL values of the actual and spoofed addresses | D All of the above |
54. Phishing is a one kind of
- | | |
|------------------|-----------------|
| A Spamming | B Impersonation |
| C Identity Theft | D Scanning |
55. COCOMO is used to estimate
- | | |
|---|---|
| A Effort and duration based on the size of the software | B Size and duration based on the effort of the software |
| C Size, effort and duration based on the cost of software | D None of the above |
56. Which of the following is not desired in a good SRS document ?
- | | |
|---------------------------|--|
| A Functional requirements | B Non-functional requirements |
| C Goals of implementation | D Algorithms for software implementation |
57. Which of the following combination is desirable for modular software design ?
- | | |
|--------------------------------|-------------------------------|
| A High cohesion, high coupling | B High cohesion, low coupling |
| C Low cohesion, high coupling | D Low cohesion, low coupling |
58. Which of the following testing technique uses fault simulation technique ?
- | | |
|------------------|--------------------|
| A Unit testing | B Beta testing |
| C Stress testing | D Mutation testing |

59. Given the following expression grammar
 $E \rightarrow E * F \mid F + E \mid F$
 $F \rightarrow F - F \mid id$
 Which of the following is true ?
- A '*' has higher precedence than '+' B '-' has higher precedence than '*'
 C '+' has higher precedence than '*' D '+' and '-' have same precedence
60. Which of the following suffices to convert an arbitrary CFG to an LL(1) grammar ?
- A Removing left recursion alone B Factoring the grammar alone
 C Both A and B D None of the above
61. In which machine all of the moves for an alphabet must be specified?
- A Finite Automata B NFA
 C NFA – Λ D All of the above
62. $(a+b)^*$ represents
- A Null String B String starting with a
 C All Strings of a's and b's D None of the above
63. Conversion from NFA to DFA is done by
- A Kleen's Theorem B Cook's Theorem
 C Minimization Algorithm D Subset construction
64. Which of the following is a top down parser ?
- A Recursive descent parser B Operator precedence parser
 C An LR (k) parser D An LALR (k) parser
65. Which of the following is not performed during compilation ?
- A Type checking B Dynamic memory allocation
 C Inline expansion D Symbol Table Management
66. Which one of the following is FALSE?
- A User level threads are not scheduled by the kernel. B Context switching between user level threads is faster than context switching between kernel level threads.
 C Kernel level threads cannot share the code segment D When a user level thread is blocked, all other threads of its process are blocked.

67. Which of the following requires a device driver ?

A Register	B Cache
C Main Memory	D Disk

68. The root directory of a disk should be placed

A At a fixed address in main memory	B At a fixed location on the disk
C At a fixed location on the system disk	D Any where on the disk

69. Which of the following scheduling does not suffer from starvation ?

A Shortest Job First	B Round Robin
C Priority queuing	D None of the above

70. An operating system implements a policy that requires a process to release all the resources before making a request to another resource. Select the TRUE statement from the following.

A Starvation can occur but deadlock can not occur	B Starvation cannot occur but deadlock can occur
C Both starvation and deadlock can occur	D None of the above

71. Which of the following is not shared by the threads of the same process ?

A Stack	B Address space
C File Descriptor Table	D Message queue

72. A counting semaphore was initialized to 10. Then 6 P(wait) operations and 4 V(signal) operations were completed on this semaphore. The resulting value of semaphore is

A 0	B 8
C 10	D 12

73. If the time-slice used in RR scheduling policy is more than the maximum time required to execute any process, then policy will

A Degenerate to SJF scheduling	B Degenerate to priority scheduling
C Degenerate to FCFS scheduling	D Can't say

74. Consider the join of a relation R with a relation S. If R has m tuples and S has n tuples, then the maximum and minimum sizes of the join respectively are:

A $m+n$ and 0	B mn and 0
C $m+n$ and $m-n$	D mn and $m+n$

75. In functional dependency Armstrong inference rules refers to

- A Reflexive, Augmentation and Decomposition B Augmentation, Transitive, Reflexive and Decomposition
- C Reflexive, Transitive and Decomposition D Transitive, Augmentation and Reflexive
76. Which of the following concurrency control protocols ensure both conflict serializability and freedom from deadlock?
 I. 2-phase locking
 II. Time-stamp ordering
 A I only B II only
 C Both I and II D Neither I nor II
77. Precompiled queries are faster in RDBMS as
 A They are stored in special memory B Database engines gives them priority
 C They are compiled once only D All of the above
78. RDBMS uses Mathematical concepts to relate the tables.
 A Set Theory B Boolean Algebra
 C Both A and B D None of the above
79. Which of the following is correct with respect to Two phase commit protocol?
 A Prevents Deadlock B Detects Deadlock
 C Recover from Deadlock D Ensures serializability
80. Which one of these is characteristic of RAID 5?
 A Dedicated parity B Double parity
 C Distributed parity D Hamming code parity
81. The rank of a matrix $\begin{bmatrix} 6 & 0 & 0 \\ 4 & 2 & 0 \\ 1 & 5 & 3 \end{bmatrix}$ is
 A 2 B 3
 C 0 D 1
82. A linear system $x + 3y + 5z = 1$, $2x + 6y + 10z = 2$, $x - y - 2z = 5$ has
 A Unique solution B No Solution
 C Infinite number of solutions D None of these
83. If $A = \begin{bmatrix} 5 & 1 & 3 \\ 0 & 6 & 2 \\ 0 & 0 & 7 \end{bmatrix}$ then eigen values of A^{-1} are
 A 5, 6, 7 B 1, 2, 3
 C $\frac{1}{5}, \frac{1}{6}, \frac{1}{7}$ D 6, 2, 3
84. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 5 & 3 & 2 \end{bmatrix}$ then $A^3 - 7A^2 + 14A - 8I$ is equal to
 A Null Matrix B Identity Matrix

- 85 C Non-Singular Matrix D None of these
 $\lim_{x \rightarrow 0} \frac{8 \tan x - 7 \sin x}{x^2}$ is equal to
A 1 B 2
C 3 D 0
- 86 The value of improper integral $\int_0^\infty e^{-x} dx$ is
A 0 B 1
C 2 D -1
- 87 If $U = \tan^{-1} \left(\frac{xy}{x^2 - y^2} \right)$ then $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y}$ is equal to
A 0 B U
C 2U D 3U
- 88 If $\phi = xyz$ then $\text{curl}(\text{grad} \phi)$ is
A $\nabla \phi$ B $\nabla^2 \phi$
C $\mathbf{0}$ D $\nabla^3 \phi$
- 89 The value of $\oint_C xy dx + 3x^2 dy$, where C is square bounded by $x = 0$, $x = 1$, $y = 0$ and $y = 1$ is
A $\frac{5}{2}$ B $\frac{2}{5}$
C 5 D 2
- 90 Solution of $(2xy + e^y)dx + (x^2 + xe^y)dy = 0$ is
A $xy + x e^y = c$ B $xy + e^y = c$
C $x^2 y + x e^y = c$ D $x^2 y^2 + e^y = c$
- 91 Solution of $\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} + 4y = e^{2x}$ is
A $C_1 e^{2x} + C_2 e^{-2x} + x^2 e^{2x}$ B $(C_1 + C_2 x) e^{-2x} + x^2 e^{-2x}$
C $(C_1 + C_2 x) e^{2x} + \frac{x^2}{2} e^{2x}$ D $(C_1 x + C_2 x^2) e^{2x} + \frac{x^2}{2}$
- 92 Inverse Laplace transformation of $\frac{1}{(s-3)(s-4)(s-7)}$ is
A $\frac{1}{4} e^{3t} - \frac{1}{3} e^{4t} + \frac{1}{12} e^{7t}$ B $e^{3t} - e^{4t} + e^{7t}$
C $e^{2t} - e^{3t} + e^{7t}$ D $t(e^{3t} - e^{4t} + e^{7t})$
- 93 Which one is Analytic function
A \bar{Z} B $Z\bar{Z}$
C $|Z|$ D Z^2
- 94 Value of $\int_C \frac{Z^2}{Z-2} dZ$, (where C is $|Z-2| < 1$) is
A πi B $6\pi i$
C $8\pi i$ D $2\pi i$
- 95 Residue of $f(Z) = \frac{Z-1}{Z^2(Z-3)}$ at simple pole is
A 2 B 9
C $\frac{2}{9}$ D 0
- 96 Newton-Raphson iteration formula for $x^2 + x - 1 = 0$ is
A $x_{n+1} = \frac{2x_n^2 + 1}{2x_n}$ B $x_{n+1} = \frac{x_n^2 - 1}{2x_n + 1}$

- C $x_{n+1} = \frac{x_n^2 + 1}{2x_n - 1}$ D $x_{n+1} = \frac{x_n^2 + 1}{2x_n + 1}$
- 97 Value of integral $\int_0^1 \frac{1}{1+x^2} dx$ using Simpson's 1/3 rule with step size $h = 0.5$ is
 A 0.78333 B 0.87333
 C 0.68333 D 0.74333
- 98 If $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$, $h = 0.1$, by Rungee-Kutta third order method to what is an approximate value of $y(0.1)$
 A 0.9832 B 0.9578
 C 0.8048 D 0.9051
- 99 If a card is chosen from a standard deck of cards, what is the probability of getting a diamond or club ?
 A $\frac{1}{2}$ B $\frac{1}{4}$
 C $\frac{1}{3}$ D $\frac{1}{6}$
- 100 In a normal distribution $E(X - \mu)^2$ is
 A Variance B Mean
 C Percentile D Quantile

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1. Number of unknowns in statically determinate problems are

A Not more than 3	B 3 only
C 2	D More than 3
2. The shear strength of mild steel, as compared to its tensile strength, is about

A $\frac{1}{4}$	B $\frac{1}{3}$
C $\frac{1}{8}$	D $\frac{1}{2}$
3. A simply supported beam with rectangular cross-section is subjected to a central concentrated load. If the width and depth of the beam are doubled, then the deflection at centre of the beam will be reduced to

A 50%	B 25%
C 12.5%	D 6.25%
4. Principal strains occur in the direction of

A principal stresses	B principal planes
C coordinates	D orthogonal planes
5. The radial stress in a thin cylindrical shell is

A negligible	B $\frac{Pr}{t}$
C $\frac{Pr}{2t}$	D $\frac{Pr}{4t}$
6. An orthotropic material has

A non-homogeneous property	B inelastic properties
C different properties in three perpendicular directions	D same properties in orthogonal directions
7. In a beam AB (end A is fixed), the reacting moment $M/2$ at the end A due to application of moment at B is known as

A carry over moment	B distribution moment
C stiffness moment	D fixed end moment
8. The fixed end in a conjugate beam is taken in actual beam is

A simply supported	B free end
C fixed	D hinged
9. Slope and deflection of beams of varying flexural rigidity may be easily computed by the method of

A Macaulay	B Mohr
C Conjugate beam	D Moment distribution
10. The kinematic indeterminacy is determined using _____ for pin jointed plain frames

A $2j - r$	B $3j - r$
C $4j - r$	D $6j - r$
11. The stiffness coefficient K_{ij} indicates

A force at 'i' due to a unit deformation at 'j'	B deformation at 'j' due to a unit force at 'i'
C deformation at 'i' due to a unit	D force at 'j' due to a unit deformation at

26. Box type structure of caisson has the shape of
 A rectangle B hexagon
 C triangle D slit
27. The factor safety for pier foundation on rock bed is generally taken as
 A 1.5 to 2 B 5 to 8
 C 2 to 3 D 3 to 5
28. Dynamic formulae cannot be used to obtain carrying capacity in
 A Dry sands B Saturated sands
 C Dry gravels D Saturated clays
29. In the region of 'made up soil', the type of foundation most suitable is
 A isolated footing B pile foundation
 C combined footing D stepped foundation
30. For efficient dissipation of the energy, the Froude number of the incoming flow should be between
 A 2 to 4 B 4.5 to 9
 C 9 to 11 D 11.5 to 13
31. The critical slope in an open channel is
 A directly proportional to N B directly proportional to N^2
 C inversely proportional to N D inversely proportional to N^2
32. Pitot tube is used to measure
 A pressure head B velocity head
 C discharge coefficient D velocity variation
33. Rotameter is used to measure
 A velocity through the pipe B discharge through the pipe
 C velocity profile through the pipe D static pressure in the pipe
34. Concept of boundary layer was first introduced by
 A Von-Karman B Nikuradse
 C Bernoulli D Prandtl
35. The total energy line in a pipe flow is always higher than hydraulic gradient line. The vertical distance between the two represents
 A a datum head B pressure head
 C the velocity head D piezometric head
36. A hydraulic model of a spillway is constructed with a scale 1:16. If the prototype discharge is 2048 cumec, then the corresponding discharge for which the model should be tested is
 A 1 cumec B 2 cumec
 C 4 cumec D 8 cumec
37. A well is considered to be good if it is sunk into
 A Clay B Sand
 C Coarse gravel D Silt
38. Humidity is measured by
 A hydrometer B hyetometer
 C anemometer D hygrometer
39. Infiltration rate is always
 A more than the infiltration capacity B less than the infiltration capacity
 C equal to or less than the infiltration capacity D equal to or more than the infiltration capacity

40. 'Bank Storage' in a dam reservoir
 A increases the computed reservoir capacity B decreases the computed reservoir capacity
 C sometimes increases and sometimes decreases the computed reservoir capacity D has no effect on the computed reservoir capacity
41. The ratio of the 'average width' to the 'axial length' of a drainage basin is called
 A compactness coefficient B ratio factor
 C form factor D runoff factor
42. Hydraulic jump is an example of
 A rapidly varied flow B spatially varied flow
 C gradually varied flow D unsteady flow
43. The contraction joints in a gravity dam are provided
 A to ensure proper transfer of stresses B to eliminate stress concentrations
 C to prevent cracks in the dam that may develop due to temperature changes D to facilitate the construction of dam in stages
44. Cross drainage works are not required when the canal is completely
 A a ridge canal B a contour canal
 C side slope canal D carrier canal
45. The weight of silt carried by the river per unit volume of water is termed as
 A silt grade B silt factor
 C silt ratio D silt charge
46. The crest level of barrage is kept
 A almost at the river bed level with large gates B high with no gates
 C high with large gates D low with no gates
47. The suction pressure on an ogee spillway is caused when the head on the spillway is
 A equal to the design head B < the design head
 C > the design head D \geq the design head
48. The ratio of maximum sewage flow to average sewage flow for mains up to 1 m diameter is
 A 1.5 B 2
 C 3 D 4
49. Lead poisoning occurs when the lead content in water is
 A 50 – 100 ppm B 30 – 50 ppm
 C 3 – 5 ppm D 0.3 – 0.5 ppm
50. Bleaching powder is
 A lime B chloride of lime
 C hypo-chlorite of lime D hypo-chloride of lime
51. Beds of granular activated carbon can be made to act
 A as filters B as adsorbent
 C both as filter and adsorbent D as coagulants
52. The lowest point on the inside surface of a sewer is known as
 A discharge point B invert
 C silting point D sewer point
53. In plain settling tank, suspended solids are reduced from
 A 10 to 20% B 20 to 40%
 C 40 to 70% D 70 to 90%

54. The principal air pollutant responsible for leaching and discoloration on building materials is
 A NO₂ B Ozone
 C Oxidants D SO₂
55. _____ is a primary air pollutant
 A Oxides of nitrogen B Ozone
 C Formaldehyde D Peroxy Acetyl Nitrate
56. If D.O concentration falls down to zero in any natural drainage, it indicates the zone of
 A Degradation B Active decomposition
 C Recovery D Cleaner Water
57. The visible plume, which is in form of fan or cone with well defined cone and dragged or diffused bottom is called
 A looping B conning
 C lofting D fumigation
58. The standard concentration of carbon monoxide adopted by Environmental Protection Agency (EPA) is _____ ppm (1 hour, Not more than once per year)
 A 20 B 25
 C 30 D 35
59. _____ are used only for removing coarse dusts (> 1-2 μ range) where high efficiency is not required.
 A Spray tower B Cyclone scrubber
 C Venturi scrubber D Packed scrubber
60. The rate of change of radius of transition curve is variable in
 A cubic parabola B lemniscate
 C Both (A) and (B) D spiral
61. Soundness test is performed to know the behavior of aggregate against
 A weathering action B corrosion
 C fatigue D creep
62. IRC has recommended Vehicle Damage Factor (VDF) for the initial traffic volume of 1000 CV/day (commercial vehicles per day) in plain terrain is
 A 1.5 B 2.5
 C 3.5 D 4.5
63. The minimum camber, as recommended by Indian Road Congress, for water bound macadam surface road is
 A 1.7 to 2% B 2 to 2.5%
 C 2.5 to 3% D 3 to 4%
64. The time by which activity completion time can be delayed without affecting the start of succeeding activities, is known as
 A Duration B Total float
 C Free float D Interfering float
65. The lane distribution factor for four lanes single carriage-way is _____ in both directions.
 A 100% B 75%
 C 60% D 40%
66. In traffic engineering, _____ is the number of vehicles occupying a unit length of the moving lane of a roadway at a given instant.
 A Traffic volume B Headway
 C Traffic density D Space mean speed
67. The sign 'Overtaking Prohibited' is an example of
 A Regulatory sign B Cautionary sign
 C Informatory sign D Warning sign

68. The maximum length of vehicle that can be used on Indian Roads is
 A 8 m B 12 m
 C 13 m D 14 m
69. The combined movement of merging and diverging of traffic streams moving in the same general direction is called
 A at grade B rotary
 C intersecting D weaving
70. _____ percentile speed shows the vehicles whose speed may cause interference with traffic stream.
 A 15th B 50th
 C 85th D 98th
71. _____ change the length of green signal interval, in accordance with the actual volumes on the particular approach of the intersection.
 A Co-ordinated traffic signals B Vehicle actuated signals
 C Flashing signals D Linked traffic signals
72. FAA recommends that the runway length after having been corrected for elevation and temperature should be further increased at the rate of _____ for every 1% of effective gradient.
 A 10% B 20%
 C 30% D 40%
73. The normal landing case require that aircraft should come to a stop within _____ of the landing distance.
 A 40% B 50%
 C 60% D 70%
74. In Railway Engineering, the flanges of wheels are in the shape of a cone with a slope of about
 A 1 in 20 B 1 in 25
 C 1 in 30 D 1 in 35
75. Latitude and departure of a station with respect to the preceding station is called
 A consecutive coordinate B cylindrical coordinate
 C cartesian coordinate D spherical coordinate
76. Radiation plane table surveying is the best suited when
 A distances are long but accessible B distances are short and accessible
 C distances are long and inaccessible D distances are short but inaccessible
77. The drainage layer is
 A Surface course B Subbase
 C Base Course D Subgrade
78. _____ is an operation of levelling in which a line of levels is run to determine the approximate elevations along a route
 A Reciprocal levelling B Profile levelling
 C Check levelling D Fly levelling
79. When the length of any chord of a curve is less than peg interval, it is known as
 A Sub chord B Small chord
 C Normal chord D Short chord
80. Froude's transition curve is
 A Bernoulli's lemniscate B Cubic Parabola
 C Cubic spiral D Ellipse

81. The possible value(s) of determinant of an elementary matrix is/are
- | | | | |
|---|---|---|------------|
| A | 1 | B | ± 1 |
| C | 0 | D | any number |
82. If $AB = I$, where I is the identity matrix, then
- | | | | |
|---|--------------|---|--------------------|
| A | $BA = I$ | B | $A^{-1} = B$ |
| C | $B^{-1} = A$ | D | $B^{-1}A^{-1} = I$ |
83. Which form of numbers from given below is not an indeterminate form?
- | | | | |
|---|------------|---|-----------------|
| A | 1^∞ | B | 0^0 |
| C | ∞^0 | D | ∞^∞ |
84. A local minimum value point of $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x$ is
- | | | | |
|---|---|---|----|
| A | 3 | B | -1 |
| C | 1 | D | -3 |
85. For the backward difference operator ∇ , $\nabla^2 y_2$ is
- | | | | |
|---|---------------------------|---|-----------------------------------|
| A | $\nabla y_2 - \nabla y_1$ | B | $\nabla y_3 - \nabla y_2$ |
| C | $y_3 - 2y_2 + y_1$ | D | $\nabla y_{5/2} - \nabla y_{3/2}$ |
86. If (x_0, y_0) is a local extreme value of $u = f(x, y)$, then at (x_0, y_0) , which of the following statements is incorrect?
- | | | | |
|---|------------------------|---|-------------------------|
| A | $u_x = 0$ | B | $u_y = 0$ |
| C | $u_x = 0$ or $u_y = 0$ | D | $u_x = 0$ and $u_y = 0$ |
87. For $u = \tan^{-1}\left(\frac{y}{x}\right)$, $\frac{\partial u}{\partial x} =$ _____
- | | | | |
|---|------------------------|---|------------------------|
| A | $\frac{y}{x^2 + y^2}$ | B | $\frac{x}{x^2 + y^2}$ |
| C | $\frac{-x}{x^2 + y^2}$ | D | $\frac{-y}{x^2 + y^2}$ |
88. For the function $u = x^3 \phi(y/x)$ the value of $x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy}$ is
- | | | | |
|---|------|---|------|
| A | u | B | $2u$ |
| C | $3u$ | D | $6u$ |
89. For $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, $\text{div}(\vec{r}) =$ _____
- | | | | |
|---|-------------------------------|---|-------------------------------|
| A | 0 | B | 3 |
| C | $\hat{i} + \hat{j} - \hat{k}$ | D | $\hat{i} + \hat{j} + \hat{k}$ |
90. For an analytic function $f(z) = u(x, y) + iv(x, y)$, the correct option is
- | | | | |
|---|-------------------------------|---|------------------------------|
| A | $u_z = -v_y$ and $u_y = -v_x$ | B | $u_z = v_y$ and $u_y = -v_x$ |
| C | $u_z = v_y$ and $u_y = v_x$ | D | $u_z = -v_y$ and $u_y = v_x$ |
91. What is the order of zero of $f(z) = \frac{(z^2-1)(z-1)}{z^6+1}$ at $z = 1$?
- | | | | |
|---|---|---|---|
| A | 1 | B | 2 |
|---|---|---|---|

92. Let E be the event that a student will appear in PG CET examination and F be the event that a student will appear in GATE examination. If $P(E) = 0.70$, $P(F) = 0.50$ and $P(E \cap F) = 0.30$, then what is the probability that the student will appear in one of the examination?
- A 0.40 B 1.00
C 0.90 D 0.85
93. In a random experiment of rolling a die, A is the event of turning odd number and B is the event of turning prime number on the die in a single role. Then $P(B/A) =$ _____
- A $\frac{1}{2}$ B $\frac{2}{3}$
C $\frac{1}{3}$ D $\frac{3}{4}$
94. $\int_0^{\ln 2} e^{e^x} e^{2x} dx =$ _____
- A $e^2 - e$ B e^2
C $2e^2$ D $e^2 - 2e$
95. If $L\{f(t)\} = \bar{f}(s)$ then $L\left\{\frac{f(t)}{t}\right\}$ is _____
- A $\int_s^\infty \bar{f}(u) du$ B $\frac{\bar{f}(s)}{s}$
C $-\frac{d}{ds} \bar{f}(s)$ D $s\bar{f}(s)$
96. $L\{H(t-2)e^{t-2}\} = \frac{\quad}{\quad}$. Here $H(t-a)$ is Heaviside step function.
- A $\frac{e^{-2s}}{s-1}$ B $\frac{e^{2s}}{s-1}$
C $\frac{s-2}{e^{-2s}}$ D $\frac{s-2}{e^{2s}}$
97. A coin is tossed 5 times. What is the probability of getting three head?
- A $\frac{5}{48}$ B $\frac{5}{16}$
C $\frac{15}{48}$ D $\frac{25}{48}$
98. For the differential equation $\frac{d^2y}{dx^2} - 6y = x^2 + 2$, its particular integral is _____
- A $\frac{1}{6}x^2 - \frac{7}{18}$ B $-\frac{1}{6}x^2 + \frac{7}{18}$
C $\frac{1}{6}x^2 + \frac{7}{18}$ D $-\frac{1}{6}x^2 - \frac{7}{18}$
99. $\frac{\partial^2 u}{\partial x^2} = c^2 \frac{\partial^2 u}{\partial y^2}$ is _____
- A one dimensional wave equation B two dimensional wave equation
C one dimensional Laplace equation D two dimensional Laplace equation
100. The line integral $\frac{1}{2} \int_C (x dy - y dx)$, for a simple closed curve C represents _____
- A length of the curve B area bounded by the curve
C half the length of the curve D none

Seat No. _____

SUB: MECHATRONICS (MC)

Time: 1 Hour 30 minutes

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. 5/2 way single solenoid valve has
A 2 ports 2 position
B 5 ports 2 position
C 5 ports 5 position
D 2 ports 5 position
2. The designation M 33 x 2 of a bolt means
A metric threads of 33 nos in 2 cm
B metric threads with cross-section of 33 mm
C metric threads of 33 mm outside diameter and 2 mm pitch
D bolt of 33 mm nominal diameter having 2 threads per cm
3. Which of the following is the output of a thermocouple ?
A Alternating current
B Direct current
C A.C. Voltage
D D.C. Voltage
4. LVDT windings are wound on
A copper
B ferrite
C aluminium
D steel sheets (laminated)
5. The resistivity of the conductor depends on
A material of conductor
B area of conductor
C length of conductor
D none of above
6. In 8085 microprocessor, the RST6 instruction transfer programme execution to following location
A 0024H
B 0030H
C 0048H
D 0060H
7. The circuits in the 8085A that provide the arithmetic and logic functions are called the
A CPU
B ALU
C I/O
D None of these
8. Lowest critical frequency is due to pole and it may be present origin or nearer to origin, then it is which type of network?
A LC
B RL
C RC
D any of the above
9. A control system in which the control action is somehow dependent on the output is known as
A closed loop system
B open loop system
C semiclosed loop system
D none of the above
10. One of the properties of Linear Programming Model is
A it will not have constraints
B it should be easy to solve
C it must be able to adopt to solve any type of problem
D the relationship between problem variables and constraints must be linear

11. In transportation problem the column, which is introduced in the matrix to balance the rim requirements, is known as:
 - A dummy column
 - B idle column
 - C slack column
 - D key column
12. In Hungarian method of solving assignment problem, the row opportunity cost matrix is obtained by:
 - A dividing each row by the elements of the row above it
 - B subtracting the elements of the row from the elements of the row above it
 - C subtracting the smallest element from all other elements of the row
 - D subtracting all the elements of the row from the highest element in the matrix
13. Group replacement policy is most suitable for:
 - A trucks
 - B infant machines
 - C street light bulbs
 - D new cars
14. PLCs are _____ designed for use in the control of a wide variety of manufacturing machines and systems
 - A special-purpose industrial computers
 - B personal computers
 - C electromechanical systems
 - D All of the above
15. The PLC is used in _____
 - A machine tools
 - B automated assembly equipment
 - C moulding and extrusion machines
 - D all of the above
16. For handling greater currents induction wattmeters are used in conjunction with
 - A potential transformers
 - B current transformers
 - C power transformers
 - D either of the above
17. Induction type single phase energy meters measure electric energy in
 - A kW
 - B Wh
 - C kWh
 - D VAR
18. The direction of rotation of a D.C. series motor can be changed by
 - A interchanging supply terminals
 - B interchanging field terminals
 - C either of (A) and (B) above
 - D None of the above
19. Differentially compound D.C. motors can find applications requiring
 - A high starting torque
 - B variable speed
 - C frequent on off cycles
 - D low starting torque
20. Starters are used with D.C. motors because
 - A these motors have high starting torque
 - B these motors are not selfstarting
 - C to restrict armature current as there is no back e.m.f. while starting
 - D back e.m.f. of these motors is zero initially
21. When measuring power in a circuit with low current, the wattmeter current coil should be connected
 - A to the load side
 - B to the source side
 - C anywhere, either load side or source side, does not matter
 - D in series with the load along with CT for current amplification
22. The time base signal in a CRO is
 - A a sinusoidal signal
 - B a square wave signal
 - C a triangular wave signal
 - D a sawtooth signal
23. A car is raining at a constant speed of 50 km/h, which of the following is the feedback element for the driver?

- A Clutch
C Needle of the speedometer
- B Eyes
D Steering wheel
24. Assignment problem is basically a
A Maximisation Problem
C Primal problem
- B Transportation Problem
D Minimisation Problem
25. If primal problem is a maximisation problem, then the dual will be
A Maximisation Problem
C Mixed Problem
- B Minimisation Problem
D None of the above
26. The corrosion resistance property of stainless steels is due to the presence of
A manganese
C cobalt
- B chromium
D silicon
27. Recrystallization temperature is one
A at which crystals first start forming from molten metal when it is cooled
C at which new spherical crystals first begin to form from the old deformed one when a strained metal is heated
- B at which change of allotropic form takes place
D at which crystals grow bigger in size
28. The transfer function is applicable to which of the following?
A Linear and time invariant systems
C Linear systems
- B Linear and time variant systems
D Nonlinear systems
29. The initial response when the output is not equal to input is called
A transient response
C dynamic response
- B error response
D either of the above
30. In electro pneumatic system analogy the current is considered analogous to
A velocity
C air flow
- B pressure
D air flow rate
31. The working cycle in case of four stroke engine is completed in following number of revolutions of crankshaft
A $1/2$
C 2
- B 1
D 4
32. Scavenging air in diesel engine means
A air used for combustion sent under pressure
C burnt air containing products of combustion
- B forced air for cooling cylinder
D air used for forcing burnt gases out of engine's cylinder during the exhaust period
33. In S.I. units pressure is expressed in
A kgf/cm^2
C N/m^2 or bar
- B mm. of mercury
D None of the above
34. A perfect gas is one which obey's
A all gas laws
C only Charle's law
- B only Boyle's law
D none of the above
35. Work done is zero in case of
A adiabatic process
C constant volume process
- B polytropic process
D isothermal process
36. During the transformation of water into steam, the temperature remains constant, the heat added is known as
A liquid heat
- B total heat

37. Compression ratio of LC. engines is
- | | |
|--|--|
| C latent heat of steam | D specific heat |
| A the ratio of volumes of air in cylinder before compression stroke and after compression stroke | B volume displaced by piston per stroke and clearance volume in cylinder |
| C ratio of pressure after compression and before compression | D swept volume/cylinder volume |
38. is used to drive a rotary compressor
- | | |
|-------------|------------------|
| A Engine | B Electric motor |
| C Air motor | D Either A or B |
39. In a steam engine can be a horizontal, vertical or inclined. This classification is according to the
- | | |
|------------------------|------------------------|
| A expansion of steam | B position of cylinder |
| C field of application | D speed of the engine |
40. Reciprocating compressors are employed to compress air up to a pressure of bar
- | | |
|------|-----------------|
| A 20 | B 40 |
| C 80 | D More than 100 |
41. In a typical medium speed 4stroke cycle diesel engine the inlet valve opens
- | | |
|---|---|
| A at 20° before top dead center and closes at 35° after the bottom dead center | B opens at top dead center and closes at bottom dead center |
| C opens at 10° after top dead center and closes 20° before the bottom dead center | D may open or close anywhere |
42. The common refrigerant used in domestic refrigerator is
- | | |
|-----------|-------------------|
| A Ammonia | B Sulphur dioxide |
| C Freon | D Carbon dioxide |
43. A hydraulic accumulator normally consists of
- | | |
|--|--|
| A two cylinders, two rams and a storage device | B a cylinder and a ram |
| C two coaxial rams and two cylinders | D a cylinder, a piston, storage tank and control valve |
44. Hydraulic and pneumatic circuits
- | | |
|--|---|
| A Perform the same way for all functions | B Perform differently for all functions |
| C Perform the same with some exceptions | D Does not perform all the functions |
45. The use of compressor is not required in
- | | |
|-----------------------------|-----------------------------|
| A Vapour compression system | B Bell coleman refrigerator |
| C Vapour absorption system | D Air refrigeration system |
46. If the initial tension in the belt is increased
- | | |
|---|--|
| A the power transmitted by the belt increases | B the power transmitted by the belt reduces |
| C the power transmitted may increase upto a limit and then decrease | D the power transmitted by the belt remains same |
47. For constant velocity ratio positive drive with large centre distance between driver and driven shaft
- | | |
|---------------------------|------------------------|
| A gear drive is used | B V-belt drive is used |
| C flat belt drive is used | D chain drive is used |
48. Displacement, velocity and acceleration of a particle are

- C clearance angle D lip angle
63. Cast iron and steel pipes are produced by
A slush casting B investment casting
C centrifugal casting D die casting
64. Critical path is ascertained in
A CPM method B PERT method
C both of the above D none of the above
65. Optical flats are made of
A quartz B glass
C plastics D fiber
66. Micro-controllers are _____ than the PLCs
A bulky and expensive B portable and cheaper
C bulky but cheaper D portable but expensive
67. The type of memory which is fast and temporarily stores the data which are immediately required for use is called as _____
A HDD B ROM
C SSD D RAM
68. CAD/CAM is the relationship between
A science and engineering B design and manufacturing
C manufacturing and marketing D design and marketing
69. The basic geometric building blocks provided in a CAD/CAM package are
A points B lines
C circles D all of the mentioned
70. Which materials-processing technology gives the advantage of precision, accuracy and optimum use of cutting tools, which maximise their life and higher labour productivity?
A Flexible manufacturing systems (FMS) B Industrial robots
C NC (and CNC) machine tools D Computer-integrated manufacturing (CIM)
71. Surface grinding is done to produce
A tapered surface B flat surface
C internal cylinder holes D all of these
72. Which of the following sensors determines the relationship of the robot and its environment and the objects handled by it
A internal state sensors B external state sensors
C both (a) and (b) D none of the above
73. The Robot designed with cylindrical coordinate systems has
A two linear and one rotational movement B three linear movements
C three rotational movements D two rotational and one linear movement
74. A twist drill is specified by its
A shank, material and diameter B shank, lip angle and size of flute
C material, length of body and helix angle D any one of these
75. The type of tool used on milling machine and broaching machine is
A single point cutting tool B two point cutting tool
C three point cutting tool D multipoint cutting tool
76. Following are the advantages of hot working of metals, except

- A close tolerances can be maintained
C grain structure of the metal is refined
- B porosity of the metal is minimized
D no residual stresses are introduced
77. In rolling, the pressure is maximum at
A entrance
C both the extremities
- B exit
D at a point somewhat between the two extremities
78. Which is false statement about annealing.
Annealing is done to
A relieve stresses
C improve machining characteristic
- B harden steel slightly
D soften material
79. In which of the following process the ductility of material decreases?
A hot working
C warm working
- B cold working
D none of the mentioned
80. Finite element method formulation of problem results in a system of
A algebraic equations
C Arthimatic equations
- B logical equations
D flow equations
81. The rank of a matrix $\begin{bmatrix} 2 & 4 & 6 \\ 0 & 3 & 1 \\ 0 & 0 & 5 \end{bmatrix}$ is
A 2
C 0
- B 3
D 1
82. A linear system $x + 2y + 3z = 2$, $2x + y + z = 1$, $x + y + 2z = 3$ has
A Infinite number of solutions
C Unique solution
- B No Solution
D None of these
83. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 6 & 7 \end{bmatrix}$ then eigen values of A^{-1} are
A $1, \frac{1}{3}, \frac{1}{7}$
C 3, 7, 1
- B 2, 4, 6
D 1, 3, 7
84. If $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ then $A^3 - 5A^2 + 7A - 3I$ is equal to
A Identity Matrix
C Null Matrix
- B Non-Singular Matrix
D None of these
85. $\lim_{x \rightarrow 0} \frac{5 \sin x - 3 \tan x}{x^2}$ is equal to
A 1
C 3
- B 2
D 0
86. The value of improper integral $\int_0^\infty e^{-2x} dx$ is
A 0
C 1
- B $\frac{1}{2}$
D 2
87. If $U = \tan^{-1} \left(\frac{x-y}{x+y} \right)$ then $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y}$ is equal to
A U
C 3U
- B 2U
D 0
88. If $\phi = x^2 y z$ then $\text{curl}(\text{grad} \phi)$ is
A $\nabla \phi$
C 0
- B $\nabla^2 \phi$
D $\nabla^3 \phi$

- 89 The value of $\oint_C y^2 dx + 3xydy$, where C is square bounded by $x = 0$, $x = 1$, $y = 0$ and $y = 1$ is
- A $\frac{1}{2}$ B 2
C $\frac{1}{3}$ D 3
- 90 Solution of $(e^y + 1) \cos x dx + e^y \sin x dy = 0$ is
- A $e^y \sin x = c$ B $(e^y + 1) \sin x = c$
C $(e^y + 1) \cos x = c$ D $e^y \cos x = c$
- 91 Solution of $\frac{d^2y}{dx^2} - 10\frac{dy}{dx} + 25y = e^{5x}$ is
- A $C_1 e^{5x} + C_2 e^{-5x} + x^2 e^{5x}$ B $(C_1 + C_2 x) e^{-5x} + x^2 e^{-5x}$
C $(C_1 + C_2 x) e^{5x} + \frac{x^2}{2} e^{5x}$ D $(C_1 + C_2 x) e^{5x} + x e^{5x}$
- 92 Inverse Laplace transformation of $\frac{1}{s^2(s^2+1)}$ is
- A $t \sin t$ B $t^2 + \sin t$
C $t - \sin t$ D $2t + \sin 2t$
- 93 Which one is Analytic function
- A e^Z B \bar{Z}
C $|Z|$ D $Z\bar{Z}$
- 94 Value of $\int_C \frac{3Z}{Z-1} dZ$, (where C is $|Z-1| < 2$) is
- A $6\pi i$ B $2\pi i$
C πi D $4\pi i$
- 95 Residue of $f(Z) = \frac{5}{Z^2(Z-3)}$ at simple pole is
- A 0 B 5
C $\frac{5}{9}$ D 9
- 96 Newton-Raphson iteration formula for $x^2 - x + 1 = 0$ is
- A $x_{n+1} = \frac{2x_n^2 - 1}{2x_n}$ B $x_{n+1} = \frac{2x_n^2 - 1}{2x_n - 1}$
C $x_{n+1} = \frac{x_n^2 + 1}{2x_n - 1}$ D $x_{n+1} = \frac{x_n^2 + 2}{2x_n - 1}$
- 97 Value of integral $\int_0^1 \frac{1}{1+x} dx$ using Simpson's 3/8 rule with step size $h = 0.25$ is
- A 0.6932 B 0.9673
C 0.6833 D 0.9633
- 98 If $\frac{dy}{dx} = x - y^2$, $y(0) = 1$, $h = 0.1$, by Runge-Kutta second order method to what is an approximate value of $y(0.1)$
- A 0.9145 B 0.7665
C 0.6555 D 0.9589
- 99 Three coins are tossed together and let random variable X be the number of heads in each outcome then Standard deviation is

	A	$\frac{\sqrt{5}}{2}$	B	$\frac{1}{2}$
	C	$\frac{\sqrt{5}}{3}$	D	$\frac{\sqrt{3}}{2}$
100	In binomial distribution formula of calculating mean is			
	A	$\mu = p + q$	B	$\mu = np$
	C	$\mu = pq$	D	$\mu = nq$

Seat No. _____

SUB: TEXTILE ENGINEERING (TE)

Time: 1 Hour 30 minutes

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. A fibre with extremely high stretch ability is
A Viscose B Spandex
C Nylon D Wool
2. Which of the following fibre has the odour of burning paper when subjected to burning test?
A Silk B Wool
C Jute D Cotton
3. Density of cotton fibre is approximately
A 1520 kg/m^3 B 1.52 g/m^3
C 1.52 kg/cm^3 D 1.52 g/tex
4. Nylon 6, Nylon 66, wool and silk can all be classified as
A Polyethers B Polyamides
C Polyolefins D Polyurathanes
5. Functional group and orientation can be characterized respectively by using
A Scanning electron microscope and Infrared spectrophotometer B Scanning electron microscope and Differential scanning calorimeter
C Infrared spectrophotometer and Sonic modulus tester D Differential scanning calorimeter and Infrared spectrophotometer
6. By introducing microgrooves in polyester filament
A Moisture absorption improves B Dye penetration improves
C Handle improves D All of the above
7. Absorption regain percentage of mercerized cotton is
A Less than cotton B More than cotton but less than wool
C More than wool D Less than wool and cotton
8. Which of the following amino acids is responsible for relatively higher wet strength in wool
A Threonine B Serine
C Cystine D Tyrosine
9. The chemical used in the steeping process in the manufacture of viscose rayon is
A Sodium hydroxide B Calcium Hydroxide
C Nitric acid D Carbon disulphide
10. The fibre which has a mineral origin is
A Flax B Kapok
C Ramie D Asbestos
11. Among the following, strength/weight ratio is highest for
A Polyester B Nylon
C Polypropylene D Kevlar

12. The gum in the raw silk filament is

A Wax	B Lignin
C Sericin	D Fibroin
13. With reference to carding, long nose feed plate is suitable for

A Short fibres	B Long fibres
C Cotton fibres	D Synthetic fibres
14. During spinning of a yarn on ring frame, the yarn tension is maximum at

A Lappet guide	B Maximum balloon radius
C Traveller	D Front roller nip
15. The weight of material on a roving bobbin is 2.4 kg. The roving hank is 600 tex. If delivery rate is 20 m/min, the time (min) required to build the bobbin is

A 180	B 190
C 200	D 210
16. Which of the following types of fibres tend to stay in core of the ring spun yarn?

A Short Fibres	B Long Fibres
C Course Fibres	D More crimped fibres
17. Compared to the spinning of finer cotton yarns, the preferred rotor diameter for the production of very coarse cotton yarns would

A Be higher	B Be lower
C Remain the same	D Change depending on fibre strength
18. Carding action takes place between

A Cylinder & licker in	B Flats & doffer
C Doffer & doffer roller	D Cylinder & doffer
19. One of the objective of drawing is to

A Remove neps in sliver	B Remove entanglements between fibres
C Crush large size dust particles	D Remove short fibres
20. Autoleveller performance is affected by

A Moisture	B Draft
C Fibre fineness	D Fibre length
21. While working synthetic fibres in card, the height of licker-in teeth is

A Greater than that of cotton	B Same as that of cotton
C Same but point density is less	D Shorter than that of cotton
22. DREF spinning belongs to

A Self-twist spinning	B Friction spinning
C Twistless spinning	D Air jet spinning
23. As the fibres land on the rotor, the fibres are in groups of

A More than 500 fibres	B 100-500 fibres
C 10-50 fibres	D 1-5 fibres
24. With increase in draft, drafting force

A Continuously rises	B Continuously decreases
C Increase first and then decreases	D Does not change at all
25. Bang-off is associated with

A Fast reed warp protection	B Loose reed warp protection
C Warp stop motion	D Side weft fork stop motion
26. With increased taper angle on a sectional warping machine, one could require to

A Increase traverse speed	B Decrease traverse speed
C Increase warping speed	D Decrease warping speed

27. A precision winder has to wind 4 kg of 40 tex yarn. If the machine winds at 800 m/min, without any interruption, the time taken(min) for winding would be
 A 125 B 100
 C 25 D 12.5
28. In over-pick loom, the shuttle velocity can be increased by
 A Increasing the length of picking B Rotating the picking cam on strap bottom shaft
 C Using a large nosebit of the picking cam D By increasing the swell pressure
29. A double lift double cylinder jacquard would normally produce
 A Bottom closed shed B Centre closed shed
 C Semi open shed D Open shed
30. While weaving a cloth on an automatic shuttle loom bumping can be avoided by
 A Changing the shedding timing B Increasing picks per unit length
 C Decreasing warp tension D Increasing warp tension
31. A conjugate cam driven sley
 A Moves along the horizontal plane B Can be moved as per a desired displacement function
 C Has an adjustable eccentricity D Does not need a rocking shaft
32. Split drying system is employed on sizing machines for drying
 A Very dense warp sheet B Very wide warp sheet
 C Warp sheet with very high wet pick up D Multi coloured warp sheet
33. With reference to winding technology, wind is defined as
 A Number of coils per traverse B Number of coils in double traverse
 C Number of grooves in the drum D Winding speed in m/min
34. During shedding operations, negative cams actually control
 A Raising and lowering of B Raising of the heald
 C Lowering of the heald D Either raising or lowering of the heald
35. The actual production of an automatic loom for 2 hours, running at 230 RPM with 48 PPI is 11.68 m. What will be the percent efficiency of the loom?
 A 80 B 81
 C 82 D 83
36. Length of yarn in a bunch on a pirn of automatic loom approximately equals
 A Half the reed width B The reed width
 C Twice the reed width D Four times the reed width
37. Dyeing of silk is carried out by using
 A Disperse dyes B Acid dyes
 C Pigment colours D Any one of the above
38. Crock meter is used to measure following property of a dyed fabric.
 A Rubbing fastness B Perspiration fastness
 C Laundry fastness D Fastness to gas fading
39. During bleaching of cotton with H₂O₂, the stabilizer used is
 A Sodium hydroxide B Sodium silicate
 C Acetic acid D Sodium carbonate
40. Crease resist finishing of cotton fabric does not lead to
 A Reduction in tensile strength B Increase in dimensional stability
 C Increase in moisture regain D Increase in bending length

41. The fibre that dissolves in 59% (w/w) sulfuric acid solution is
 A Wool B Polypropylene
 C Cotton D Viscose
42. A typical curve between equilibrium dye uptake and dyeing temperature goes through a maximum. After the maximum, the dye uptake decreases because
 A Dyeing is an exothermic process B Pressure in the dye bath increases
 C Saturation value is reached D Kinetic energy increases rapidly
43. Sodium persulphate is used in
 A Bleaching B Scouring
 C Desizing D Mercerization
44. The highest rates of production in printing is obtained by
 A Flat bed printing B Rotary printing
 C Roller printing D Block printing
45. Sodium formaldehyde sulfoxylate is
 A Reducing agent B Mild oxidizing agent
 C Thickener D Hygroscopy agent
46. The efficacy of the wash-n-wear treatment can be estimated by measuring its
 A Bending length B Tensile strength
 C Dye uptake D Crease recovery
47. Which, out of the following, is not a surfactant
 A Detergent B Dispersing agent
 C Wetting agent D Reducing agent
48. Softener reduces the bending rigidity of fabrics by decreasing
 A Inter-fibre and inter-yarn friction B Modulus of the fibres
 C Glass transition temperature of the fibres D Packing coefficient of yarns
49. In a flat bed knitting machine, the loop length is controlled by
 A Raising cam B Clearing cam
 C Stitch cam D Guard cam
50. A plain single jersey fabric
 A Exhibits curling from technical back to technical front along course line B Exhibits curling from technical back to technical front along wale line
 C Exhibits curling from technical front to technical back along wale line D Exhibits curling from technical back to technical front along course line and curling from technical front to technical back along wale line
51. In fully relaxed state, the loop shape factor (defined as a ratio of courses per unit length to wales per unit length) of a plain weft knitted cotton fabric will be approximately
 A 5.5 B 4.2
 C 1.3 D 0.3
52. The underlap of warp knitted fabric is basically equivalent to
 A Closed loop B Sinker loop
 C Needle loop D Open loop
53. In weft knitted fabrics of the same mass per unit area produced from the same yarn, the structure which will give the highest thickness is
 A Plain B Rib
 C Purl D Interlock

54. The instrument which works on CRE as well as CRL principle is
 A Stelometer B Pressley fibre strength tester
 C Cambridge extensometer D Inclined plane principle
55. What is the resultant count of a 3 ply yarn in Ne, when a 100 Nm worsted yarn, 90 denier polyester and 59.05 text cotton yarn are twisted together?
 A 8.1 B 7.4
 C 6.6 D 5.2
56. Uniformity ratio is
 A 50% span length/2.5 span length B 2.5 span length/50% span length
 C Mean length/upper half mean length D Upper half mean length/ Mean length
57. Shirley yarn hairiness tester
 A Usually measures fiber longer than 10 mm B Usually measures total length of hairs per cm of yarn
 C Usually measures number of hairs of multiple lengths together D Usually measures number of fiber longer than 3 mm
58. In Classimat results which among the following is longest and thinnest
 A H1 B H2
 C I1 D I2
59. Cotton fibre maturity is indicated by
 A Increase in thickness of lumen B Increase in thickness of primary wall
 C Increase in thickness of secondary wall D All of the above
60. A higher value of drape coefficient indicates
 A Stiffer fabric B Limpy fabric
 C Highly compressible fabric D Very flexible fabric
61. Bursting strength is indicative of
 A Warp way strength B Weft way strength
 C Multi directional strength D Wale wise strength
62. CV% is approximately equal to
 A $U\%/1.25$ B $U\%/1.25$
 C $1.25/U\%$ D $1.25*U\%$
63. The ratio of weight of water present in textile material to oven dry weight of textile material indicates
 A Moisture content B Moisture Regain
 C Absolute humidity D Relative humidity
64. Assuming race-tracked cross section of threads, the ratio of major to minor diameters of yarns for a jammed plain woven fabric will be
 A 0.13 B 0.31
 C 1.3 D 3.1
65. In an ideally 5 layered open packed yarn, the number of fibres in 5th layer and total fibres will be respectively
 A 6, 7 B 12, 19
 C 25, 62 D 31, 93
66. The relationship between cloth cover and air permeability is
 A Exponential B Hyperbolic
 C Parabolic D Linear
67. In ideal migration, the numerical value for the fibre mean position in yarn is
 A 0 B 0.5

- C 1.0 D Indeterminate
68. Statistical analysis of variation in yarn count can be carried out by
A Binomial Distribution B Poisson Distribution
C Normal Distribution D Chi – Square Distribution
69. Statistical analysis of report of defective cloth rolls can be carried out by
A Binomial Distribution B Poisson Distribution
C Normal Distribution D Chi – Square Distribution
70. For 60s reed count(stockport) and 3 ends per dent denting, the total ends in the 160 cm width will be
A 5760 B 5670
C 5067 D 5076
71. Diameter of a 50 denier polyester yarn (in cms) approximately will be
A 0.072 B 0.027
C 0.0072 D 0.0027
72. For weaving a plain woven fabric with 6 heald shafts and skip draft, how many minimum cams are needed?
A 2 B 3
C 4 D 6
73. A design repeating on 45 cm along the length & 30 cm across the width of the fabric having 40 ends/cm & 35 picks/cm will require a jacquard capacity of
A 1800 B 1350
C 1400 D 1200
74. If the barrel of a dobby has 12 grooves then minimum no. of lags needed in a chain for a weave repeating on 18 picks is
A 12 B 18
C 36 D 48
75. If d is the yarn diameter, then the closest thread spacing attainable without thread distortion in a square set plain weave made from same set of yarns in both direction will be
A $1.237 * d$ B $1.327 * d$
C $1.723 * d$ D $1.732 * d$
76. Polypropylene is not preferred for agro textile as
A It is very expensive B It has poor elongation
C It has poor UV protection D It does not have enough strength
77. Wet spinning technique is commercially used to produce filament yarn of
A Polypropylene B Polyester
C Nylon 66 D Acrylic
78. An example of a coagulant used in textile effluent treatment is
A Activated carbon B Ferrous sulphate
C Hydrogen peroxide D Sodium chloride
79. The major pollutant found in flame retardant finish is
A Antimony B Nickel
C Copper D Zinc
80. Which technique is more useful to separate salts and organic compounds from textile effluents?
A Reverse Osmosis B Micro filtration
C Ultra-filtration D Nano filtration
81. For the matrix $A = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$

- A $A^2 + 4A - 3I = 0$ B $A^2 - 4A + 3I = 0$
 C $A^2 - 4A - 3I = 0$ D $A^2 + 4A + 3I = 0$
82. For an elementary matrix E
 A $E^T = E$ B $\det(E) \neq 0$
 C $E^T = -E$ D $E^{-1} = E$
83. Which of the following functions does not satisfy the hypothesis of Roll's theorem?
 A $f(x) = x(1-x); [0, 1]$ B $f(x) = \frac{x^2-2x}{x-3}; [0, 2]$
 C $f(x) = x^2 - 5x + 6; [2, 3]$ D $f(x) = x^2 - 3x + 2; [1, 3]$
84. The critical points of $f(x) = x^{5/2} - 5x^{1/2}$ are
 A $0, \pm\sqrt{5}$ B ± 1
 C $0, \pm 1$ D $\pm\sqrt{5}$
85. $f(x) = x^3 - 2x + 5$ has a root in interval
 A $[0, 1]$ B $[2, 3]$
 C $[-1, 0]$ D $[-3, -2]$
86. $x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}$; $k = 0, 1, 2, \dots$ is the iteration scheme for
 A Bisection method B Secant method
 C Regula-Falsi method D Newton-Raphson method
87. For homogeneous function $u = \frac{x^3+y^3}{x-y}$
 A $u_x + u_y - 2u = 0$ B $xu_x + yu_y - 2u = 0$
 C $xu_x + yu_y - 3u = 0$ D $u_x + u_y - 3u = 0$
88. For the differential equation $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 6y = e^{2x} + e^{3x}$, its complementary function (C.F.) is
 A $c_1e^{-x} + c_2e^{6x}$ B $c_1e^{2x} + c_2e^{3x}$
 C $c_1e^{-2x} + c_2e^{-3x}$ D $c_1e^x + c_2e^{-6x}$
89. For $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, $\text{curl}(\vec{r})$ is
 A rotational B irrotational
 C solenoidal D compressible
90. If $L\{f(t)\} = \bar{f}(s)$ then $L\{tf(t)\}$ is
 A $\int_s^\infty \bar{f}(u) du$ B $\frac{\bar{f}(s)}{s}$
 C $-\frac{d}{ds}\bar{f}(s)$ D $s\bar{f}(s)$

91. The polar form of Cauchy-Riemann equations for $f(z) = u(r, \theta) + iv(r, \theta)$ is
 A $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = \frac{1}{r} \frac{\partial u}{\partial \theta}$ B $\frac{\partial u}{\partial r} = -\frac{1}{r} \frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = \frac{1}{r} \frac{\partial u}{\partial \theta}$
 C $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$ D $\frac{\partial u}{\partial r} = -\frac{1}{r} \frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = -\frac{1}{r} \frac{\partial u}{\partial \theta}$
92. If $I = \oint_{|z|=2} \frac{dz}{z-1}$ over the circle $|z| = 2$, then
 A $I = 0$ B $I = 2\pi$
 C $I = 2\pi i$ D $I = 1$
93. For $0 < |z - 1| < 1$, the Laurent series of $f(z) = \frac{1}{(1-z)^2(2-z)}$ about $z = 1$ is $\frac{1}{(z-1)^2} + \frac{1}{z-1} + 1 + (z-1) + (z-1)^2 + \dots$. Which of the statements given below is incorrect?
 A $z = 1$ is a singular point of multiplicity 2 B $z = 1$ is a simple pole
 C $z = 2$ is a simple pole D $z = 2$ is a simple singular point
94. In an experiment of tossing a coin three times the probability of getting at least two HEAD is.....
 A $\frac{1}{8}$ B $\frac{1}{4}$
 C $\frac{3}{8}$ D $\frac{1}{2}$
95. $\frac{P(A/B)}{P(B/A)} = \frac{P(A \cap B)}{P(A)}$: $\frac{P(A)}{P(B)}$
 A $\frac{P(B)}{P(A)}$ D $P(A \cup B)$
96. $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx =$ _____
 A $\pi^3/8$ B $\pi^3/24$
 C $\pi^3/12$ D $\pi^3/6$
97. $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{\sin x} \right] =$ _____
 A 0 B ∞
 C -1 D $-1/2$
98. The differential equation $\frac{d^2 y}{dt^2} + \frac{3}{t} \frac{dy}{dt} + \frac{2y}{t^2} = \sin t$ is
 A a nonlinear differential equation B Bessel's equation
 C Legendre's homogeneous equation D Jacobi equation
99. For the forward difference operator Δ , what is $\Delta^2(x^2)$, with step size 1?
 A 0 B $x + 2$
 C $2x$ D 2
100. If a random variable has the probability density $f(x) = \begin{cases} x, & \text{for } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$; the mean of the given probability density is
 A 1 B $1/3$
 C $1/2$ D $3/4$

Seat No. _____

SUB: MECHANICAL ENGINEERING (ME)

Time: 1 Hour 30 minutes

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non -programmable scientific calculator is allowed

1. The resultant of two forces $(P + Q)$ and $(P - Q)$ equals to $(3P^2 + Q^2)^{1/2}$. The forces are then inclined to each other at the angle of
A 30° B 60°
C 90° D 120°
2. Two balls are dropped from the same point with an interval of one second. If $g = 10 \text{ m/s}^2$, their separation three seconds after the release of first ball would be
A 5 m B 15 m
C 25 m D 30 m
3. For a projectile of range R , the kinetic energy is minimum after the projectile covers (from start) a distance equal to
A 0.25 R B 0.5 R
C 0.75 R D R
4. Two bodies of masses m and $2m$ are dropped from the top of a building. When these bodies reach the ground, their kinetic energy will be in the ratio
A 1 : 2 B $1 : \sqrt{2}$
C 1 : 4 D 1 : 1
5. A pendulum is made of hollow sphere of negligible mass and having a small hole in the bottom. The pendulum is made to vibrate after filling it with water. As the water gradually flows out of the hole, the time period of the pendulum will
A increase B decrease
C may increase or decrease D remain unchanged
6. An attempt to turn a key into a lock manifests in the application of
A coplanar force B moment
C couple D torque
7. The radius of gyration of a circular area of radius r with respect to centroidal axis is
A 0.1 r B 0.2 r
C 0.5 r D 0.7 r
8. A body weighing 400 N is resting on a rough horizontal table. A pull of 120 N applied at an angle of 15° with the horizontal just causes the body to slide over the table. The normal reaction is about
A 280 N B 370 N
C 400 N D 430 N
9. A ball of mass 5 kg, initially at rest, is dropped from the height 1 m. Ball hits the ground and bounces off from it. Upon impact with the ground, the velocity reduces by 20%. The height (in m) to which the ball will rise is
A 0.76 B 0.52
C 0.40 D 0.64

10. The ratio of elongation of a prismatic bar due to its total self-weight W to that of similar bar with an additional weight W attached to its free end is
 A $1/3$ B $2/3$
 C $3/4$ D $1/2$
11. Thermal stress is generally induced in a component when
 1. a temperature gradient exists in the component
 2. the component is free from any restraint
 3. the component is restrained to expand or contract freely
 Which of the statement(s) given above is (are) correct?
 A 1 and 2 B 2 and 3
 C 3 only D 2 only
12. In a strained material one of the principal stress equals twice the other. What will be the ratio of maximum principal stress to maximum shear stress?
 A 1 B 2
 C 4 D 8
13. The strain energy stored in a body due to external loading, within the elastic limit, is known as
 A malleability B ductility
 C toughness D resilience
14. A simply supported beam has equal overhanging lengths and carries equal concentrated load P at ends. Then the bending moment over the length between the supports
 A is zero B is a non-zero constant
 C varies uniformly from one support to the other D is maximum at mid span
15. The ratio of average shear stress to the maximum shear stress in a beam with square cross-section is
 A 1 B $2/3$
 C $3/2$ D 2
16. Two shafts of solid circular cross-section are identical except for their diameter d_1 and d_2 . Under the same torque, the ratio of strain energy stored in each shaft (U_1/U_2) will confirm the relation
 A d_2/d_1 B $(d_2/d_1)^2$
 C $(d_2/d_1)^3$ D $(d_2/d_1)^4$
17. A closed coil helical spring is cut into two equal parts. The stiffness of each resulting spring as compared to the original spring will be
 A one forth B one half
 C same D double
18. When the slider in a four-bar linkage is fixed, it forms the mechanism of
 A hand pump B reciprocating engine
 C quick return D oscillating cylinder
19. In order to draw acceleration diagram, it is necessary to determine the Coriolis component of acceleration in case of
 A crank and slotted lever quick return mechanism B slider crank mechanism
 C pantograph D four bar mechanism
20. The mid-section of flat pulley is slightly raised to
 A reduce tension in belt B increase the angle of contact
 C avoid lateral slip of the belt D save the pulley from any damage from the belt joints

21. Common contact ratio of a pair of spur pinion and gear is
 - A less than 1.0
 - B equal to 1
 - C between 2 and 3
 - D greater than 3
22. The maximum efficiency of a screw jack provided with square threaded screw and angle of friction equals to 30° will be
 - A 27%
 - B 33%
 - C 50%
 - D 61%
23. If the ratio of the length of connecting rod to the crank radius increases, then
 - A primary unbalanced forces will increase
 - B primary unbalanced forces will decrease
 - C secondary unbalanced forces will increase
 - D secondary unbalanced forces will decrease
24. The static deflection of a shaft under a flywheel is 4 mm. What is the critical speed in rad/s if $g = 10 \text{ m/s}^2$
 - A 50
 - B 20
 - C 10
 - D 5
25. For thickness of plates greater than 8 mm, the diameter of the rivet is worked out by using the relation
 - A $d = 2 \sqrt{t}$
 - B $d = 4 \sqrt{t}$
 - C $d = 6 \sqrt{t}$
 - D $d = 8 \sqrt{t}$
26. The size of the weld in case of fillet welded joint is the
 - A smaller side of the triangle of fillet
 - B larger side of the triangle of fillet
 - C hypotenuse of the triangle of fillet
 - D perpendicular distance from root to hypotenuse
27. For a proper design and longer gear life
 - A wear load must be more than dynamic load
 - B wear load must be less than dynamic load
 - C dynamic load must be more than endurance strength
 - D wear load must be less than endurance strength
28. The main purpose of spheroidizing treatment is to improve
 - A hardenability of low carbon steels
 - B machinability of low carbon steels
 - C hardenability of high carbon steels
 - D machinability of high carbon steels
29. Which one of the following defects is 'Schottky defect'?
 - A Vacancy defect
 - B Compositional defect
 - C Interstitial defect
 - D Surface defect
30. Upper and lower yield points are observed in
 - A all pure metals
 - B carbon steels
 - C brittle metals
 - D an α - β brass
31. The decision on the volume of the design riser is based on
 - A Bernoulli's equation
 - B Continuity equation
 - C Newton's law of viscosity
 - D Chvorinov's rule
32. Which of the following materials requires the largest shrinkage allowance, while making a pattern for casting?
 - A Aluminium
 - B Brass
 - C Cast iron
 - D Carbon steel
33. Stretch forming is used for producing bent sheets without any local buckling and wrinkling. This is achieved by keeping the metal strip during the operation under
 - A tension
 - B compression
 - C high temperature
 - D low temperature
34. The punching force required in a blanking operation of mild steel sheet is 500 kN. The diameter of the blank is increased by 20% and thickness is reduced by 4%, then the punching force will be

- C 9747 D 9750
60. A body weighs 30 N and 15 N when weighed under submerged conditions in liquids of relative densities 0.8 and 1.2, respectively. What is the volume (in litre) of the body?
 A 12.50 B 3.82
 C 18.70 D 75.50
61. Consider a laminar boundary layer over a heated flat plate. The free stream velocity is U_∞ . At some distance x from the leading edge the velocity boundary layer thickness is δ_v and the thermal boundary layer thickness is δ_T . If the Prandtl number is greater than 1, then
 A $\delta_v > \delta_T$ B $\delta_T > \delta_v$
 C $\delta_v \approx \delta_T \sim (U_\infty x)^{-1/2}$ D $\delta_v \approx \delta_T \sim x^{-1/2}$
62. The temperature distribution within the thermal boundary layer over a heated isothermal flat plate is given by

$$\frac{T - T_w}{T_\infty - T_w} = \frac{3}{2} \left(\frac{y}{\delta_t} \right) - \frac{1}{2} \left(\frac{y}{\delta_t} \right)^3$$
 Where T_w and T_∞ are the temperatures of plate and free stream, respectively, and y is the normal distance measured from the plate. The local Nusselt number based on the thermal boundary layer thickness δ_t is given by
 A 1.33 B 1.50
 C 2.0 D 4.64
63. In a counter flow heat exchanger, hot fluid enters at 60°C and cold fluid leaves at 30°C. Mass flow rate of the hot fluid is 1 kg/s and that of the cold fluid is 2 kg/s. Specific heat of the hot fluid is 10 kJ/kg K and that of the cold fluid is 5 kJ/kg K. The log mean temperature difference (LMTD) for the heat exchanger in °C is
 A 15 B 30
 C 25 D 45
64. A hollow enclosure is formed between two infinitely long concentric cylinders of radii 1 m and 2 m, respectively. Radiative heat exchange takes place between the inner surface of the larger cylinder and the outer surface of the smaller cylinder. The radiating surfaces are diffused and the medium in the enclosure is nonparticipating. The fraction of the thermal radiation leaving the larger surface and striking itself is
 A 0.25 B 0.50
 C 0.75 D 1.00
65. Two insulating materials of thermal conductivities 'k' and '2k' are available for lagging a pipe carrying a hot fluid. If the radial thickness of each material is the same, then
 A material with higher thermal conductivity should be used for the inner layer and one with lower thermal conductivity for the outer layer
 B material with lower thermal conductivity should be used for the inner layer and one with higher thermal conductivity for the outer layer
 C it is immaterial in which sequence the insulating materials are used
 D it is not possible to judge unless numerical values of the dimensions are given
66. Lumped system analysis is the simplest and most convenient method that can be used to solve transient conduction problems. This analysis can be used only when Biot number (Bi) is
 A less than 0.1 B more than 0.1
 C less than 1.0 D more than 1.0
67. A furnace is made of a red brick wall of thickness 0.5 m and conductivity 0.7 W/m K. For the same heat loss and temperature drop, this can be replaced by a layer of diatomic earth of conductivity 0.14 W/m K and thickness?

A	82.4%	B	59.5%
C	72.3%	D	79.5%

- Page 8 of 11

86. General solution of $y'' - y' - 6y = 0$ is
- A $y = c_1 e^{3x} + c_2 e^{-2x}$ B $y = c_1 e^{3x} + c_2 e^{2x}$
 C $y = c_1 e^{-3x} + c_2 e^{-2x}$ D None of these
87. Determine the particular integral of $y'' - y' = -3$
- A $y_p = 2x$ B $y_p = 3x$
 C $y_p = -3x$ D None of these
88. Find the solution of $(x+1) \frac{dy}{dx} + (x+2)y = 2x e^{-x}$.
- A $(x+1) e^x y = x^3 + c$ B $(x+1) e^x y = x + c$
 C $(x+1) e^x y = x^2 + c$ D None of these
89. The particular integral of $y'' + y = \cos^2 x$
- A $y_p = \frac{1}{2} - \frac{1}{6} \cos 2x$ B $y_p = \frac{1}{2} - \frac{1}{3} \cos 2x$
 C $y_p = \frac{1}{2} - \cos 2x$ D None of these
90. The solution of $xy'' + y' = 0$ is
- A $y = c_1 x + c_2 \ln x$ B $y = c_1 x^{-1} + c_2 \ln x$
 C $y = c_1 + c_2 \ln x$ D None of these
91. Let $A = \begin{bmatrix} 5 & 2 \\ 0 & k \end{bmatrix}$. Find the number k such that A is the root of the polynomial $f(x) = x^2 - 7x + 10$.
- A 1 B 2
 C 0 D None of these
92. Choose appropriate option for eigen values of $A = \begin{bmatrix} 2 & 4 \\ -1 & 6 \end{bmatrix}$.
- A 1, 3 B 2
 C 4 D 1, 2
93. Solve $2x - 4 = 3y$, $5y - x = 5$.
- A (5, 2) B (5, -2)
 C (-5, 2) D None of these
94. Find the derivative of $f(z) = 3z^{-2}$ at $z = 1 + i$.
- A $\frac{3}{2} + \frac{3}{2}i$ B $\frac{5}{2} + \frac{3}{2}i$

C $\frac{1}{2} + \frac{3}{2}i$

D $\frac{3}{2} - \frac{3}{2}i$

95. Choose correct Cauchy Integral formula for $n = 1, 2, 3, \dots$.

A $f^{(n)}(a) = \frac{n!}{\pi i} \oint_C \frac{f(z)}{(z-a)^{n+1}} dz$

B $f^{(n)}(a) = \frac{n!}{\pi i} \oint_C \frac{f(z)}{(z)^{n+1}} dz$

C $f^{(n)}(a) = \frac{(n+1)!}{\pi i} \oint_C \frac{f(z)}{(z-a)^{n+1}} dz$

D $f^{(n)}(a) = \frac{n!}{2\pi i} \oint_C \frac{f(z)}{(z-a)^{n+1}} dz$

96. Choose correct option for the series of $\cot z$.

A $z - \frac{z}{3} - \frac{z^3}{45} + \dots$

B $\frac{1}{z} - \frac{z}{3} - \frac{z^3}{45} + \dots$

C $z - \frac{z}{3} - \frac{z^3}{15} + \dots$

D None of these

97. A card is drawn at random from an ordinary deck of 52 playing cards. Find the probability that it is an ace.

A $\frac{1}{3}$

B $\frac{2}{3}$

C $\frac{1}{13}$

D $\frac{2}{13}$

98. Find the probability that in tossing a fair coin three times, there will appear two tails and one head.

A $\frac{3}{8}$

B $\frac{1}{2}$

C $\frac{3}{4}$

D $\frac{1}{3}$

99. Determine the interval where root lies for the function $f(x) = x^3 - x - 1$.

A $(0, 1)$

B $(-1, 0)$

C $(1, 2)$

D $(2, 3)$

100. Choose appropriate formula of Trapezoidal rule for $\int_{x_0}^{x_1} f(x) dx$ where $x_0 < \xi < x_1$.

A $\frac{h}{3} [f(x_0) + f(x_1)] - \frac{h^3}{12} f''(\xi)$



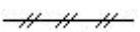

B $\frac{h}{2} [f(x_0) + f(x_1)] - \frac{h^3}{12} f''(\xi)$

C $\frac{h}{4} [f(x_0) + f(x_1)] - \frac{h^3}{12} f''(\xi)$

D None of these

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1. Internal resistance of ideal voltage source is
 (A) Zero (B) finite
 (C) 100 ohms (D) Infinite
2. Standard test signals in control system are
 (A) Impulse (B) Step
 (C) Ramp (D) All of above
3. For stable system location of poles in s plane is _____
 (A) On left half (B) On right half
 (C) On center (D) None of above
4. If an impulse response of a system is e^{-5t} , what would be its transfer function?
 (A) $1/s - 5$ (B) $1/s + 5$
 (C) $s - 5$ (D) None of above
5. The 8051 has _____ 16-bit counter/timers
 (A) 1 (B) 2
 (C) 3 (D) 4
6. Pick out the one which is a first order instrument.
 (A) Bare Thermometer (B) Bare metallic thermometer.
 (C) Bare vapor pressure thermometer. (D) All (a), (b) and (c).
7. The symbol for "capillary line" in instrumentation diagram is
 (A)  (B) 
 (C)  (D) 
8. For given second order transfer function $T(s) = 4/[s^2 + 2s + 4]$ has a damping factor
 (A) 2.0 (B) 0.5
 (C) 1.0 (D) 4.0
9. Which of the following controllers has the least maximum deviation?
 (A) P-controller (B) I-controller
 (C) PI-controller (D) PD-controller
10. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is
 (A) Stable (B) unstable
 (C) Limitedly stable (D) Either (a) or (c)
11. Which control action is also called rate control?

- (A) *P*-controller (B) *D*-controller
(C) *PI*-controller (D) *I*-controller
12. An op-amp has very _____.
(A) high voltage gain (B) high input impedance
(C) low output impedance (D) all of the above
13. If an error signal $e(t)$ of an ON-OFF controller is found to be greater than zero, what would be its output?
(A) 10% (B) 50%
(C) 80% (D) 100%
14. If the system is specified by open loop transfer function $G(s)H(s) = k / s(s+3)(s+2)$, how many root loci proceed to end at infinity?
(A) 2 (B) 3
(C) 5 (D) 6
15. In P-D controller, the derivative action plays a significant role in increasing _____ of response.
(A) Time (B) Distance
(C) Speed (D) Volume
(C) Marginally stable (D) Unpredictable
16. Which of the following is true for bimetallic type thermometer?
(A) Two metals have same temperature coefficients (B) Two metals have different temperature coefficients
(C) One metal is cooled always (D) Both(a) and (b)
17. Kelvin is unit of
(A) Pressure (B) Temperature
(C) Level (D) Flow
18. Accuracy of a measuring instrument indicates the
(A) Closeness of the output reading to the true value (B) Ratio of output value to the input value
(C) Change in output with each change in input (D) Degree of freedom from random errors
19. Gain of an instrument is defined as
(A) Closeness of the output reading to the true value (B) Ratio of output value to the input value
(C) Change in output with error (D) Degree of freedom from random errors
20. For a system to work, as oscillator the feedback of system is
(A) Less than 1 (B) Greater than 1
(C) Equal to 1 (D) zero
21. Smallest change which a sensor can detect is
(A) Accuracy (B) Precision
(C) Resolution (D) Scale
22. Chromatography is a physical method that is used to separate and analyse _____.
(A) Simple mixtures (B) Complex mixtures
(C) Viscous mixtures (D) Metals
23. The detectors used in optical sensors is
(A) Photo Diode (B) Diode
(C) Transistor (D) Both(a) and (b)

24. Resistor is a _____ element.
 (A) Zero order (B) First order
 (C) Third order (D) None of above
25. What is the time constant for a resistor-capacitor network?
 (A) R (B) R/C
 (C) RC (D) C/R
26. Which of the following has transfer function $G(S) = 1/(1+S\tau)$?
 (A) Zero order (B) First order
 (C) Second order (D) None of above
27. In LC circuit resonant frequency is defined by
 (A) \sqrt{L} (B) LC
 (C) \sqrt{LC} (D) $1/(\sqrt{LC})$
28. Which of following represent active transducer?
 (A) Strain gauge (B) Thermistor
 (C) LVDT (D) Thermocouple
29. What is the span of an instrument, operating under a bias which read value from 230V to 450V only?
 (A) 450 (B) 200
 (C) 220 (D) 230
30. What is 'live zero'?
 (A) Output zero for zero input (B) Output non zero for zero input
 (C) Output null for all input (D) Output unpredictable
31. Filters are used to convert
 (A) Pulsating dc signal into a pure dc signal (B) Pulsating ac signal into a pure dc signal
 (C) Pulsating dc signal into a pure ac signal (D) Pulsating ac signal into a pure ac signal
32. The output of an OR gate with three inputs, A, B, and C, is LOW when
 (A) A = 0, B = 0, C = 0 (B) A = 0, B = 0, C = 1
 (C) A = 1, B = 1, C = 1 (D) A = 0, B = 1, C = 1
33. Which of the following gates has the exact inverse output of the OR gate for all possible input combinations?
 (A) NOR (B) NOT
 (C) NAND (D) Both(a) and (b)
34. Pyrometer is used to measure
 (A) Pressure (B) Level
 (C) Temperature (D) Density
35. The sensitivity of a resistive transducer can be increased by
 (A) increasing the length of wire (B) Decrease the length of wire
 (C) increasing the current of wire (D) Decrease the current of wire
36. Flow rate Q is proportional to
 (A) Pressure (B) Square of pressure
 (C) Root of pressure (D) Square root of differential pressure
37. Damping Ratio value for unstable control system is
 (A) 1 (B) 0

- (C) 10 (D) -1
38. Turbine meters are generally preferred for
 (A) Low viscosity and high flow measurement (B) High viscosity and high flow measurement
 (C) High viscosity and high flow measurement (D) Low viscosity and low flow measurement
39. Example for positive displacement meter is
 (A) Variable area flow meter (B) Turbine meters
 (C) Rotary Piston meter (D) Venturi
40. The devices used for differential pressure measurement is
 (A) Orifice plate (B) Manometer
 (C) Rota meter (D) None of above
41. For the measurement of flow rate of liquid, the method used is
 (A) Orifice plate (B) Manometer
 (C) Bourdon tube (D) Rota meter method
42. Which language is more popular for PLC programming?
 (A) Graphical (B) Text base
 (C) Ladder Logic (D) Assembly
43. _____ method is used for contact less temperature measurement system
 (A) Thermocouple (B) RTD
 (C) Thermister (D) Pyrometer
44. For pneumatic type of system value for supply pressure is
 (A) 14.7 PSI (B) 3 PSI
 (C) 15 PSI (D) 3-15PSI
45. FIR filter is
 (A) open loop filter (B) close loop filter
 (C) both (a) and (b) (D) none of above
46. Which of the following is not the triple point of water?
 (A) 32°R (B) 273°K
 (C) 492°R (D) 32°F
47. Configuration of Bourdon spring tube is never made of _____ shape.
 (A) circular (B) semi-circular
 (C) helical (D) spiral
48. Which of the following instruments is not used for measuring sub-zero temperatures?
 (A) Platinum resistance thermometer (B) Mercury in glass thermometer
 (C) Vapor pressure thermometer (D) Radiation pyrometer
49. Split range control scheme uses
 (A) two controller and one valve (B) two controllers and two valve
 (C) one controller and one valve (D) one controller and two valves
50. Which is the strongest paramagnetic gas?
 (A) CO₂ (B) O₂
 (C) NO (D) NO₂
51. Use of hygrometer is to measure
 (A) Temperature (B) Humidity
 (C) Hygienic condition (D) High speed

52. The loop transfer function of a feedback control system is given by $G(s)H(s)=1/s(s+1)(9s+1)$ its phase cross over frequency (rad/s) is
 (A) 1.22 (B) 0.7
 (C) 0.33 (D) 0.1
53. Mercury manometer (U-tube type) exemplifies a _____ order system.
 (A) zero (B) First
 (C) second (D) Third
54. Bode stability method uses _____ loop transfer function.
 (A) open (B) Closed
 (C) either (a) or (b) (D) neither (a) nor (b)
55. Working principle of bimetallic thermometers is difference in linear co-efficient of thermal expansion of two strips of different metals welded together. Which of the following has the maximum thermal co-efficient of linear expansion?
 (A) Nickel (B) Chromel
 (C) Brass (D) none of above
56. Thermal conductivity cell is the primary element of a/an _____ analyzer.
 (A) oxygen (B) sulphur dioxide
 (C) carbon monoxide (D) Carbon dioxide
57. Which digital logic can be used as equality detector?
 (A) X-OR (B) X-NOR
 (C) AND (D) none of above
58. How many NAND gates are requiring to make HALF ADDER?
 (A) 5 (B) 4
 (C) 3 (D) none of above
59. which type of element is normally not used in the bimetallic thermometers
 (A) Flat spiral (B) Bourdon tube
 (C) Single helix (D) Multiple helix
60. Convert binary 01001110 to decimal.
 (A) 4E (B) 79
 (C) 76 (D) none of above
61. An LED made up of
 (A) Phosphorescent material (B) Germanium
 (C) Silicon (D) Gallium Arsenide
62. Three input NOR gate gives logic high output only when
 (A) One input is high (B) One input is low
 (C) All input low (D) All input high
63. For measuring the temperature of a red hot furnace, which is the most suitable instrument ?
 (A) Platinum resistance thermometer (B) Thermocouple
 (C) Optical pyrometer (D) Bimetallic thermometer
64. which temperature has highest sensitivity
 (A) Thermister (B) RTD
 (C) Thermocouple (D) none of above
65. Binary of 64 is
 (A) 1010000 (B) 1000000
 (C) 1010000 (D) 1111100

66. A digital voltmeter can count from 0 to 9999. If full scale reading is 9.999 V, the resolution of full scale reading is
 (A) 0.001 (B) 0.01
 (C) 0.00001 (D) 1
67. Radiation pyrometer is used to measure temperature in the range of
 (A) -200 to 500° C (B) 500 to 1200° C
 (C) 1200 to 2500° C (D) 0 to 500° C
68. Whether a linear system is stable or unstable that it
 (A) is a property of the system only (B) depends on the input function only
 (C) either (a) or (b) (D) both (a) and (b)
69. A stepper motor is
 (A) a two phase induction motor (B) is a kind of rotating amplifier
 (C) is an electromagnetic transducer (D) is an electromechanical device which
 used to convert an angular position of shaft into electrical signal
 actuates a train of step angular movements in response to a train of input pulses on one to one basis
70. From the noise point of view, bandwidth should
 (A) be large (B) not be too large
 (C) should be as large as possible (D) should be infinite
71. A system has its two poles on the negative real axis and one pair of poles lies on $j\omega$ axis. The system is
 (A) stable (B) unstable
 (C) limitedly stable (D) either (a) or (c)
72. A lag compensator is essentially a
 (A) low pass filter (B) high pass filter
 (C) band pass filter (D) either (a) or (b)
73. Stepper motors find applications in
 (A) X-Y plotters (B) numerically controlled machining equipment
 (C) printers (D) all of the above
74. For type 2 system, the magnitude and phase angle of the term $(j\omega)^2$ in the denominator, at $\omega = 0$, are respective
 (A) 0 and - 90° (B) 0 and + 90°
 (C) infinity and - 180° (D) infinity and + 180°
75. In an integral controller
 (A) the output is proportional to input (B) the rate of change of output is proportional to input
 (C) the output is proportional to rate of change of input (D) none of the above
76. Bode magnitude plot is drawn between
 (A) magnitude of network function and ω (B) dB magnitude and $\log \omega$
 (C) dB magnitude and ω (D) \log_e (magnitude) and $\log \omega$

77. PID controlled system has
 (A) P and I actions in forward path and D action in feedback path
 (B) P and I actions in feedback path and actions in forward path
 (C) All the three (i.e., P, I and D) actions in forward path
 (D) All the three (i.e., P, I and D) actions in feedback path
78. Bellows converts
 (A) pressure difference into displacement
 (B) pressure difference into voltage
 (C) displacement into pressure difference
 (D) None of above
79. For the transport lag $G(j\omega) = e^{-j\omega T}$, the magnitude is always equal to
 (A) 0
 (B) 1
 (C) 10
 (D) 0.5
80. The log magnitude curve for a constant gain K is a
 (A) horizontal straight line
 (B) horizontal straight line of magnitude 20 log K decibels
 (C) an inclined line having slope K
 (D) an inclined line having slope -K
81. For a square matrix A
 A $A = A^T$
 B $\det(A) = \det(A^T)$
 C $A = A^{-1}$
 D $\det(A) = \det(A^{-1})$
82. To solve a system $A\bar{X} = B$ of linear equations using Gauss-Jordan method, the augmented matrix $[A : B]$ is transformed to
 A row echelon form matrix
 B upper triangular matrix
 C reduced row echelon form matrix
 D identity matrix
83. For $f(x) = (x - 2)^{2/3}$, which of the following statements is incorrect?
 A f is continuous for all x
 B f is continuous for all x , except at 2
 C f is differentiable for all x
 D f is differentiable for all x , except at 2
84. Which of the following functions satisfies the hypothesis of the mean value theorem for differentiation?
 A $f(x) = x^{2/3}; [-1, 8]$
 B $f(x) = \sin x/x; [-\pi, 0)$ and $f(0) = 0$
 C $f(x) = x^{4/5}; [0, 1]$
 D $f(x) = (x - 1)^{1/2}; [0, 2]$
85. Which of the following is a single step method to solve differential equations numerically?
 A Adam-Bashforth method
 B Modified Euler's method
 C Taylor series method
 D Fourth-order Runge-Kutta method

86. $f(x) = x^3 + 2x - 5$ has a root in the interval $[0, 2]$. According to the bisection method, which interval will be the next?
- A $[0, 1]$ B $[1, 2]$
 C $[1/2, 2]$ D $[0, 3/2]$
87. $\int_1^2 \frac{(\ln x)^2}{x} dx = \underline{\hspace{2cm}}$
- A $\frac{8}{3} \ln 2$ B $\frac{1}{3} (\ln 2)^3$
 C $\frac{4}{3} \ln 2$ D $12 (\ln 2)^3$
88. For the function $z = f(x, y)$ to have a minimum value at a critical point, the conditions are
- A $r > 0$ and $rt - s^2 > 0$ B $r > 0$ and $rt - s^2 < 0$
 C $r < 0$ and $rt - s^2 < 0$ D $r < 0$ and $rt - s^2 > 0$
89. Which of the differential equation given below is not linear?
- A $y' + e^x y = 0$ B $y' + x e^y = y$
 C $e^x y' = x - 2y$ D $y' - y = \tan x$
90. For a level surface $\phi(x, y, z) = c$, where c is a constant, its normal is represented by
- A $\text{curl } \phi$ B $\text{div } \phi$
 C $\text{grad } \phi$ D none
91. The Laplace transform of the function $f(t) = t^2$ is
- A $\frac{1}{s}$ B $\frac{2}{s^3}$
 C $\frac{1}{s^2}$ D $\frac{6}{s^2}$
92. For an analytic function $f(z) = u(x, y) + i v(x, y)$, one can find $f'(z)$ using
- A $f'(z) = \frac{\partial u}{\partial x} + i \frac{\partial u}{\partial y}$ B $f'(z) = \frac{\partial u}{\partial x} - i \frac{\partial u}{\partial y}$
 C $f'(z) = \frac{\partial v}{\partial x} + i \frac{\partial v}{\partial y}$ D $f'(z) = \frac{\partial v}{\partial x} - i \frac{\partial v}{\partial y}$
93. If $I = \int_C z^2 dz$, where C is the upper half of the circle $|z| = 2$ in counterclockwise direction, then
- A $I = 8 \int_0^\pi (-\sin 3t + i \cos 3t) dt$ $I = 8 \int_0^\pi (\sin 3t + i \cos 3t) dt$
 C $I = 8 \int_0^\pi (-\sin 3t - i \cos 3t) dt$ $I = 8 \int_0^\pi (\sin 3t - i \cos 3t) dt$
94. What is the order of zero of $f(z) = \frac{(z^2-1)(z-1)}{z^6+1}$ at $z = \infty$?
- A 1 B 2
 C 3 D 0
95. In an experiment of tossing a coin three times the probability of getting exactly two HEAD is.....
- A $1/8$ B $1/4$
 C $3/8$ D $1/2$
96. $P(A \cap B) = \underline{\hspace{2cm}}$
- A $P(B)P(A/B)$ B $P(A)P(A/B)$

97. $\lim_{x \rightarrow 0^+} x^x = \frac{P(B)P(B/A)}{\quad}$
- A 1
C ∞
- D $P(A \cup B) - P(A) - P(B)$
B 0
D e
98. The differential equation $\frac{d^2 y}{dt^2} + \frac{1}{t} \frac{dy}{dt} + \frac{y}{t^2} = e^t$ is
- A a nonlinear differential equation
C Cauchy's homogeneous equation
- B Bessel's equation
D Jacobi equation
99. For the shift operator E , what is $E^2(x)$, with step size 1?
- A 0
C x^4
- B 1
D $x + 2$
100. The mean of the probability distribution of the number of head obtained in two flips of a balanced coin is
- A $3/4$
C $1/4$
- B 1
D $1/2$