NG 24 (GROUP A)

PART I — ENGINEERING MATHEMATICS

(Common to all Candidates)

(Answer ALL questions)

1. If A is a 3×3 matrix and determinant of A is 6, then find the value of the determinant of the matrix $(2A)^{-1}$

   a. $\frac{1}{12}$

   b. $\frac{1}{24}$

   c. $\frac{1}{36}$

   d. $\frac{1}{48}$

2. If $3x+2y+z=0$, $x+4y+z=0$, $2x+y+4z=0$, be a system of equations, then

   a. it is inconsistent

   b. it has only the trivial solution $x=0,\ y=0,\ z=0$

   c. it can be reduced to a single equation and so a solution does not exist

   d. the determinant of the matrix of coefficients is zero

3. Let $M=\begin{pmatrix}1&1&1\\0&1&1\\0&0&1\end{pmatrix}$. The maximum number of linearly independent eigen vectors of M is

   a. 0

   b. 1

   c. 2

   d. 3

4. The shortest and longest distance from the point $(1,\ 2,\ -1)$ to the sphere $x^2+y^2+z^2=24$ is

   a. $\left(\sqrt{14},\ \sqrt{46}\right)$

   b. $(14,\ 46)$

   c. $\left(\sqrt{24},\ \sqrt{56}\right)$

   d. $(24,\ 56)$

5. The solution of the given ordinary differential equation $x\frac{d^2y}{dx^2}+\frac{dy}{dx}=0$ is

   a. $y=A\log x+B$

   b. $y=Ae^{\log x}+Bx+C$

   c. $y=Ae^{x}+B\log x+C$

   d. $y=Ae^{x}+Bx^2+C$

6. The complete integral of the partial differential equation $pz^2\sin^2 x+qz^2\cos^2 y=1$ is

   a. $z=3a\cot x+(1-a)\tan y+b$

   b. $z^2=3a^2\cot x+3(1+a)\tan y+b$

   c. $z^3=-3a\cot x+3(1-a)\tan y+b$

   d. $z^4=2a^2\cot x+(1+a)(1-a)\tan y+b$

7. The area between the parabolas $y^2 = 4 - x$ and $y^2 = x$ is given by

a. $\frac{3\sqrt{2}}{16}$

b. $\frac{16\sqrt{3}}{5}$

c. $\frac{5\sqrt{3}}{16}$

d. $\frac{16\sqrt{2}}{3}$

8. The value of the integral $\int_0^a \int_0^b \int_0^c e^{x+y+z}\, dz\, dy\, dx$ is

a. e^{a+b+c}

b. $e^a + e^b + e^c$

c. $(e^a - 1)(e^b - 1)(e^c - 1)$

d. e^{abc}

9. If $\nabla\phi = 2xyz^3\,\vec{i} + x^2z^3\,\vec{j} + 3x^2yz^2\,\vec{k}$, then $\phi(x, y, z) =$

a. $\phi = xyz^2 + c$

b. $\phi = x^3yz^2 + c$

c. $\phi = x^2yz^3 + c$

d. $\phi = x^3yz + c$

10. The only function from the following that is analytic is

a. $F(z) = \mathrm{Re}(z)$

b. $F(z) = \mathrm{Im}(z)$

c. $F(z) = z$

d. $F(z) = \sin z$

11. The value of m so that $2x - x^2 + my^2$ may be harmonic is

a. 0

b. 1

c. 2

d. 3

12. The value of $\int_C \frac{1}{z} dz$, where C is the circle $z = e^{i\theta}$, $0 \le \theta \le \pi$ is,

a. πi

b. $-\pi i$

c. $2\pi i$

d. 0

13. The Region of convergence of the signal $x(n) = \delta(n - k),\ k > 0$ is

a. $z = \infty$

b. $z = 0$

c. Entire z-plane, except at $z = 0$

d. Entire z-plane, except at $z = \infty$

14. The Laplace transform of a signal $X(t)$ is $\frac{4s+1}{s^2+6s+3}$. The initial value $X(0)$ is

a. 0

b. 4

c. 1/6

d. 4/3

15. Given the inverse Fourier transform of $f(s)=\begin{cases} a-|s|, & |s|\le a \\ 0, & |s|>a \end{cases}$ is $\frac{a^2}{2\pi}\left[\frac{\sin\frac{ax}{2}}{\frac{ax}{2}}\right]^2$. The value of $\int_0^\infty\left[\frac{\sin x}{2}\right]^2 dx$ is

a. π

b. $\frac{2\pi}{3}$

c. $\frac{\pi}{2}$

d. $\frac{\pi}{4}$

16. If $A=[a_{ij}]$ is the coefficient matrix for a system of algebraic equations, then a sufficient condition for convergence of Gauss-Seidel iteration method is

a. A is strictly diagonally dominant

b. $|a_{ii}|=1$

c. $\det(A)\neq 0$

d. $\det(A)>0$

17. Which of the following formula is used to fit a polynomial for interpolation with equally spaced data?

a. Newton's divided difference interpolation formula

b. Lagrange's interpolation formula

c. Newton's forward interpolation formula

d. Least- square formula

18. For applying Simpson's $\frac{1}{3}$ rule, the given interval must be divided into how many number of sub-intervals?

a. odd

b. two

c. even

d. three

19. A discrete random variable X has the probability mass function given by $p(x)=cx,\ x=1,2,3,4,5$. The value of the constant 'c' is

a. 1/5

b. 1/10

c. 1/15

d. 1/20

20. For a Binomial distribution with mean 4 and variance 2, the value of 'n' is

a. 2

b. 4

c. 6

d. 8

PART II — BASIC ENGINEERING AND SCIENCES

(Common to all candidates)

(Answer ALL questions)

21. Speed of the processor chip is measured in
    a. Mbps
    b. GHz
    c. Bits per second
    d. Bytes per second

22. A program that converts Source Code into machine code is called
    a. Assembler
    b. Loader
    c. Compiler
    d. Converter

23. What is the full form of URL?
    a. Uniform Resource Locator
    b. Unicode Random Locator
    c. Unified Real Locator
    d. Uniform Read Locator

24. Which of the following can adsorb larger volume of hydrogen gas?
    a. Finely divided platinum
    b. Colloidal solution of palladium
    c. Small pieces of palladium
    d. A single metal surface of platinum

25. What are the factors that determine an effective collision?
    a. Collision frequency, threshold energy and proper orientation
    b. Translational collision and energy of activation
    c. Proper orientation and steric bulk of the molecule
    d. Threshold energy and proper orientation

26. Which one of the following flows in the internal circuit of a galvanic cell?
    a. atoms
    b. electrons
    c. electricity
    d. ions

27. Which one of the following is not a primary fuel?
    a. petroleum
    b. natural gas
    c. kerosene
    d. coal

28. Which of the following molecules will not display an infrared spectrum?
    a. CO_2
    b. N_2
    c. Benzene
    d. HCCH

29. Which one of the following behaves like an intrinsic semiconductor, at the absolute zero temperature?
    a. Superconductor
    b. Insulator
    c. n-type semiconductor
    d. p-type semiconductor

30. The energy gap (eV) at 300K of the material *GaAs* is
    a. 0.36
    b. 0.85
    c. 1.20
    d. 1.42

31. Which of the following ceramic materials will be used for spark plug insulator?

a. SnO_2

b. α-Al_2O_3

c. TiN

d. $YBaCuO_7$

32. In unconventional super-conductivity, the pairing interaction is

a. non-phononic

b. phononic

c. photonic

d. non-excitonic

33. What is the magnetic susceptibility of an ideal super conductor?

a. 1

b. –1

c. 0

d. infinite

34. The Rayleigh scattering loss, which varies as _____ in a silica fiber.

a. λ^0

b. λ^{-2}

c. λ^{-4}

d. λ^{-6}

35. What is the near field length N that can be calculated from the relation (if D is the diameter of the transducer and λ is the wavelength of sound in the material)?

a. $D^2 / 2\lambda$

b. $D^2 / 4\lambda$

c. $2D^2 / \lambda$

d. $4D^2 / \lambda$

36. Which one of the following represents open thermodynamic system?

a. Manual ice cream freezer

b. Centrifugal pump

c. Pressure cooker

d. Bomb calorimeter

37. In a new temperature scale say $^\circ\rho$, the boiling and freezing points of water at one atmosphere are $100^\circ\ \rho$ and $300^\circ\rho$ respectively. Correlate this scale with the Centigrade scale. The reading of $0^\circ\rho$ on the Centigrade scale is:

a. 0°C

b. 50°C

c. 100°C

d. 150°C

38. Which of the cross-section of the beam subjected to bending moment is more economical?

a. Rectangular cross-section

b. I - cross-section

c. Circular cross-section

d. Triangular cross-section

39. The velocity of a particle is given by $V = 4t^3 - 5t^2$. When does the acceleration of the particle becomes zero?

a. 8.33 s

b. 0.833 s

c. 0.0833 s

d. 1 s

40. What will happen if the frequency of power supply in a pure capacitor is doubled?

a. The current will also be doubled

b. The current will reduce to half

c. The current will remain the same

d. The current will increase to four-fold

PART III

02 – COMPUTER SCIENCE AND ENGINEERING / INFORMATION TECH.

(Answer ALL questions)

41. Which of the following invokes a function getReg(I)?
    a. Code optimization
    b. Code motion
    c. Code generation algorithm
    d. Intermediate code

42. The identification of common sub-expression and replacement of run-time computations by compile-time computation is
    a. Local optimization
    b. Loop optimization
    c. Constant folding
    d. Data flow analysis

43. Identify the incorrect statement regarding the use of generics and parameterized types in Java?
    a. Generics provide type safety by shifting more type checking responsibilities to the compiler
    b. Generics and parameterized types eliminate the need for down casts when using Java Collections
    c. When designing your own collections class (say, a linked list), generics and parameterized types allow you to achieve type safety with just a single class definition as opposed to defining multiple classes
    d. When designing your own collections class (say, a linked list), generics and parameterized types does not allow you to achieve type safety with just a single class definition as opposed to defining multiple classes

44. What is the if-then-form of the following Conditional statement? "It is time for dinner if it is 6 pm."
    a. If it is time for dinner, then it is 6pm
    b. If you want to eat dinner, then you must eat at 6pm
    c. If it is 6pm, then it is time for dinner
    d. If it is 6 pm , then it is no the time for dinner

45. Consider the following sets of processes, with the length of CPU burst time given in milliseconds:

Process	Burst time	Priority
P_1	8	4
P_2	6	1
P_3	1	2
P_4	9	2
P_5	3	3

    The processes are assumed to have arrived in the order P_1 P_2 P_3 P_4 P_5 all at time 0.Calculate average waiting time of each process by using FCFS.
    a. 13.1 ms
    b. 15.5 ms
    c. 16.4 ms
    d. 12.2 ms

46. Which of the following serves as the root parent process of all the user processes?
    a. root process
    b. parent process
    c. init process
    d. boot process

47. If parent terminated without invoking wait(), process is a
    a. Zombie
    b. Orphan
    c. Parent
    d. Client

48. Which of the following enables indirect communication in IPC?

a. Pipe

b. Shared memory

c. Link

d. Mailbox

49. Which of the following statements is true about the distributed system?

a. All processors are not synchronized

b. It is a collection of processor

c. They do not share memory

d. Both (a) and (c)

50. Which of the following computing models is not an example of distributed computing environment?

a. Cloud computing

b. Parallel computing

c. Cluster computing

d. Peer-to-peer computing

51. Which of the following models is having the most stringent consistency requirement and also called as strongest form of memory coherence?

a. Sequential Consistency

b. Strict Consistency

c. Causal Consistency

d. None of the above

52. When the physical location of the file changed in the distributed file system

a. File name also need to be changed

b. Host name of the file also need to be changed

c. Local name of the file also need to be changed

d. File name need not be changed

53. When inorder traversing a tree resulted ABCDEGFHI and post order traversing a tree resulted ACBEFGIHD; the preorder traversal would return

a. DBCAGEHIF

b. DBACHGEFI

c. DCBAGEFHI

d. IDBACGEHF

54. Consider a binary Max-heap implemented using an array. Which one of the following array represents a binary Max-heap?

a. 20, 18,15,12,10,9,16

b. 20,18,12,10,9,15,16

c. 20,12,18,10,9,15,16

d. 20,12,15,10,9,16,18

55. A B-tree of minimum degree t can have maximum ———— pointers in a node.

a. $t - 1$

b. $2t - 1$

c. $2t$

d. t

56. The number of trees in a binomial heap with n nodes is

a. $\log n$

b. n

c. $n\log n$

d. $n/2$

57. What is recurrence for worst case of quick sort and what is the time complexity in worst case?

a. Recurrence is T(n) = T(n-2) + O(n) and time complexity is O(n^2)

b. Recurrence is T(n) = T(n-1) + O(n) and time complexity is O(n^2)

c. Recurrence is T(n) = 2T(n/2) + O(n) and time complexity is O(nlog n)

d. Recurrence is T(n) = T(n/10) + T(9n/10) + O(n) and time complexity is O(nlogn)

58. Let S be an NP-complete problem and Q and R be two other problems not known to be in NP. Q is polynomial time reducible to S and S is polynomial-time reducible to R. Which one of the following statements is true?

a. R is NP – complete

b. R is NP – hard

c. Q is NP – complete

d. Q is NP – hard

59. Recursive algorithm like Merge Sort cannot use Dynamic Programming because

a. The sub problems of merge sort are not overlapping in any way

b. Dynamic programming will not handle recursion

c. Dynamic programming takes very long time and will not give optimal solution

d. Sorting cannot be handled by dynamic programming

60. A greedy algorithm is an approach for solving a problem by

a. Decision taken previously will be reversed on finding a best choice

b. Best solution is chosen out of all resultant solutions

c. The solutions of sub-problems are combined in order to achieve the best solution

d. Selecting the best option available at the moment

61. In the absolute addressing mode

a. The operand is inside the instruction

b. The address of the operand is inside the instruction

c. The location of the operand is implicit

d. The register containing the address of the operand is specified

62. The elimination stage of WAR and WAW hazards is often called

a. Anti -dependence

b. Dispatch

c. Data hazards

d. Execution

63. What is the formula for Hit Ratio?

a. Miss/(Hit + Miss)

b. (Hit + Miss)/Miss

c. (Hit + Miss)/Hit

d. Hit/(Hit + Miss)

64. The Sun micro systems processors usually follow ———— architecture.

a. CISC

b. RISC

c. ISA

d. SPARC

65. The number of additions required to compute N-point DFT using radix-2 FFT is given by

a. $N \log_2 N$

b. $(N-1)\log_2 N$

c. $(N/2)\log_2 N$

d. $4N \log_2 N$

66. The transfer function of a Butterworth filter is given by

a. $H(j\Omega)\dfrac{6}{1+\left(\dfrac{1}{\Omega_c}\right)^N}$

b. $H(j\Omega)=\dfrac{1}{1+j\left(\dfrac{2\Omega}{\Omega_c}\right)^N}$

c. $H(j\Omega)=\dfrac{1}{1+j\left(\dfrac{\Omega}{\Omega_c}\right)^N}$

d. $H(j\Omega)=\dfrac{N}{1+\left(\dfrac{\Omega}{2\Omega_c}\right)^N}$

67. Fast Fourier Transform algorithms exploit

a. Four basic properties of phase factor

b. Complex multiplications

c. Indexing and addressing operations

d. Symmetry and periodicity

68. Low pass butterworth filters are

a. All-zero filters

b. Pole-pole filters

c. All-pole filters

d. Pole-zero filters

69. What is the maximum size of data that the application layer can pass on to the TCP layer below?

a. Any size

b. 1024 bytes - size of TCP header

c. 1400 bytes

d. 4500 bytes

70. A channel has B=4 KHz, what is the channel capacity having the signal-to-noise ratio of 20 dB?

a. 24.6 kbits/s

b. 26.6 kbits/s

c. 39.8 kbits/s

d. 20.2 kbits/s

71. A bit-stuffing based framing protocol uses an 8-bit delimiter pattern of 01111110. If the output bit-string after stuffing is 01111100101, then the input bit-string is

a. 0111110100

b. 0111110101

c. 0111111101

d. 0111111111

72. If 5 TCP segments of 100 byte MSS are sent consecutively, starting with sequence number 101,201,301,401, and 501, and if the First segment is lost, the ACKs returned will have ACK numbers as

a. 101,101,101,101

b. 201,301,401,501

c. 201,201,201,201

d. 101,201,301,401

73. The CREATE TRIGGER statement is used to create the trigger. THE ———— clause specifies the table name on which the trigger is to be attached. The ———— specifies that this is an AFTER INSERT trigger.

a. for insert, on

b. on, for insert

c. for, insert

d. for, for insert

74. Which of the following is a semi join?

a. Only the joining attributes are sent from one site to another and then all of the rows are returned

b. All of the attributes are sent from one site to another and then only the required rows are returned

c. Only the joining attributes are sent from one site to another and then only the required rows are returned

d. All of the attributes are sent from one site to another and then only the required rows are returned

75. Which of the following is not a clustering method?

a. K-nearest neighbourhood method

b. Agglomerative method

c. K-means method

d. Linear search method

76. Which of the following is the characteristics of RAID -5?

a. Dedicated Parity
b. Distributed Parity
c. Double Parity
d. Single Parity

77. All activities lying on critical path have slack time equal to

a. 0
b. 1
c. 2
d. – 1

78. If P is risk probability, L is loss, then Risk Exposure (RE) is computed as

a. RE = P/L
b. RE = P + L
c. RE = P*L
d. RE = 2* P *L

79. For a function of two variables, boundary value analysis yields

a. $4n + 3$ test cases
b. $4n + 1$ test cases
c. $n + 4$ test cases
d. $n + 1$ test cases

80. Which test refers to the retesting of a unit, integration and system after modification, in order to ascertain that the changes have not introduced new faults?

a. Regression Test
b. Smoke Test
c. Alpha Test
d. Beta Test

81. The number of levels used in defining a knowledge-based agent is

a. 2
b. 3
c. 4
d. 5

82. The reason for the uncertainty in the Wumpus World Problem is that the agent's sensor provides only the following information.

a. partial and global
b. partial and local
c. full and global
d. full and local

83. Which one of the following is the ability to represent all kinds of knowledge that are needed in that domain?

a. Inferential Adequacy
b. Representation Adequacy
c. Inferential Efficiency
d. Acquisitional Efficiency

84. Which one of the following is about a specific attribute that is guaranteed to take a unique value?

a. Inverses
b. Existence in an is a hierarchy
c. Techniques for reasoning about values
d. Single valued attributes

85. Which one of the following multiplexing techniques cannot be used for analog signals?

a. Frequency Division Multiplexing
b. Wavelength Division Multiplexing
c. Time Division Multiplexing
d. All of the above

86. In a wireless network, an extended service set is considered to be a set of

a. Access Points
b. Basic service sets
c. Mobile stations
d. None of the above

87. The radius within which the receiver receives the signals with an error rate low enough to be able to communicate and can also act as a sender is

a. Transmission range
b. Detection range
c. Interference range
d. Propagation range

88. Delay spread in signal propagation is due to
a. Guidance of waves through a single path
b. Signals arriving at the receiver at different times
c. Transmission of signals through wires
d. Signals travelling along a straight line

89. Which of the following methods provides a one-time session key for two parties?
a. Diffie-Hellman
b. RSA
c. DES
d. AES

90. The most widely used ensemble method is
a. pruning
b. boosting
c. bagging
d. regret learning

91. Which one of the following options contains the list of escape character in HTML escape function?
a. &, <, >, *, "
b. &, (,), ", *
c. &, <, >, ", '
d. &,', (,), ;

92. Consider the following systems of three equations (congruences): x ≡ 2 (mod 3), x ≡ 3 (mod 5) and x ≡ 2 (mod 7). Find x?
a. 33
b. 23
c. 42
d. 51

93. The probability density function of a continuous random variable X is given by $f(x) = k(x-1)^3, 1 \le x \le 3$. The value of "$k$" is
a. 1/4
b. 1/2
c. 2
d. 4

94. If the random process is such that, "Future behavior of the process depends only on the present state and not on the past", then it is a
a. Poisson Process
b. Binomial Process
c. Markov Process
d. Stationary Process

95. The stability condition for the multi-server queueing model with "c" servers is given by
a. $\lambda < \mu$
b. $\lambda > \mu$
c. $\lambda < c\mu$
d. $\lambda > c\mu$

96. Which of the following is not a component of the ANOVA table?
a. F ratio
b. Sum of Squares
c. Degree of Freedom
d. Correction Term

97. Regular expression for all strings starting with "ab" and ending with "ba" is:
a. aba^*b^*ba
b. $ab(ab)^*ba$
c. $ab(a+b)^*ba$
d. $abba$

98. The regular expression of the language {0,01,011,0111,.....} is given by
a. $(0+1)^*$
b. $(01)^*$
c. $(0)(1)^*$
d. $01^* + 0$

99. The number of states required to accept the string ending with 010 is
a. 2
b. 3
c. 1
d. 4

100. The chromatic number of a wheel graph on n vertices denoted by W_n is
a. n
b. 3 when n is even and 4 when n is odd
c. $n-1$
d. 3 when n is odd and 4 when n is even