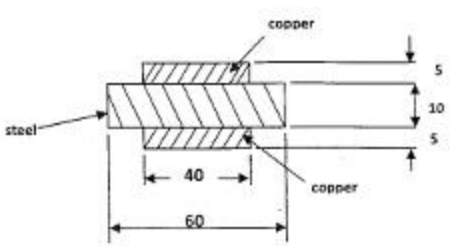
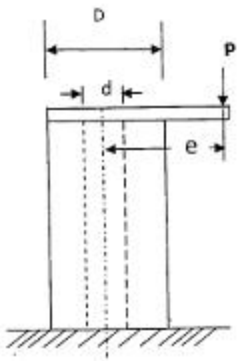
42	A system of masses rotating in different parallel planes is in dynamic balance if –			
	(a) Resultant force is zero	(b) resultant couple is zero		
	(c) resultant force is numerically equal to resultant couple	(d) resultant force and the resultant couple, both are equal to zero.		
43	A torsion bar with a spring constant `k' is cut into `n' equal lengths. The spring constant for each portion would be			
	(a) nk	(b) k^n		
	(c) k/n	(d) $k^{1/n}$		
44	Logarithmic decrement of a damped single degree of freedom system is δ. If stiffness of the spring is doubled and mass is made half, then logarithmic decrement of the new system will be equal to			
	(a) $1/2\delta$	(b) δ		
	(c) 2δ	(d) $\frac{1}{4}\delta$		
45	To ensure self locking in a screw jack it is essential that helix angle is			
	(a) larger than friction angle	(b) smaller than friction angle		
	(c) equal to friction angle	(d) such as to give maximum efficiency in lifting		
46	For a particular load distribution and support condition in a beam of length `L', bending moment at any section `x' ($O < x < L$) is given by $M(x) = Ax - Bx^2$, where A and B are constants. The shear force in the beam will be zero at 'x' equal to			
	(a) A/2B	(b) A/B	(c) 2A/B	(d) A^2/B
47	If A is $\begin{bmatrix} 8 & 5 \\ 7 & 6 \end{bmatrix}$ then $\lvert A^{121} - A^{120} \rvert$ is			
	(a) 0	(b) 1	(c) 120	(d) 121
48	If A is Square Matrix of order 3, then product of A and its transpose is			
	(a) Unit Matrix	(b) Zero Matrix		
	(c) Identity Matrix	(d) Symmetric Matrix		
49	The Matrix A= $\begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -5 \\ -1 & 5 & 0 \end{bmatrix}$ is			

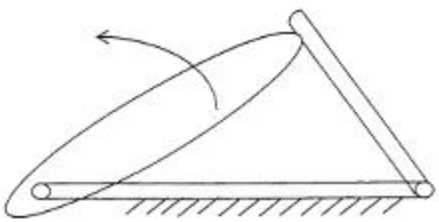
	(a) Orthogonal Matrix		(b) Skew Symmetric	
	(c) Symmetric		(d) Idempotent	
50	Vector a= 3i + 2j – 6k, vector b= 4i – 3j + k, angle between above vectors is			
	(a) 90°	(b) 0°	(c) 45°	(d) 60°
51	If the probability for A to fail an examination is 0.2 and that for B is 0.3, then probability that either A of B fail is			
	(a) 0.5	(b) 0.06	(c) 0.44	(d) 0.1
52	Area bounded by the parabola $2y = x^2$ and the line $x = y-4$ is equal to			
	(a) 4.5	(b) 9	(c) 18	(d) 36
53	Chance that a leap year selected at random will contain 53 Sundays is			
	(a) 3/7	(b) 7/2	(c) 7/3	(d) 2/7
54	$\lim_{x \to 0} \frac{x^2 + x - \sin x}{x^2}$			
	(a) 0	(b) ∞	(c) 1	(d) None of these
55	Two objects P & Q are traveling horizontally with velocity of 8 m/sec & 6 m/sec from left to right. They are separated by a distance of 15 m. The mass of the objects are 3 kg and 5 kg. If the coefficient of restitution is 0.7 what is the velocity (m/s) of P and Q after impact and when (seconds) and where (metres) will they impact with respect to initial positioning of Q. The corresponding answers are respectively			
	a) 7.6, 5.4, 2.1, 15	b) 8, 6, 2.5, 7.5	c) 7.6, 6.2, 7.5 , 45	d) None of these
56	The cross section of a compound bar 1 m long is as shown in figure. If the temperature is raised by 80° C determine the stresses (in N/mm^2) in each metal			

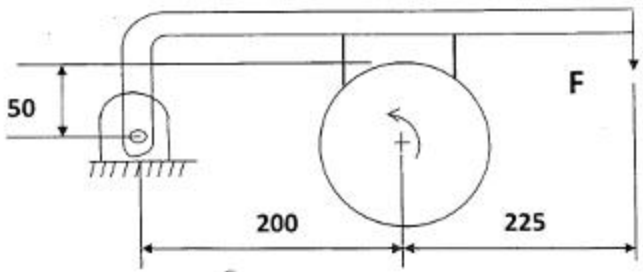
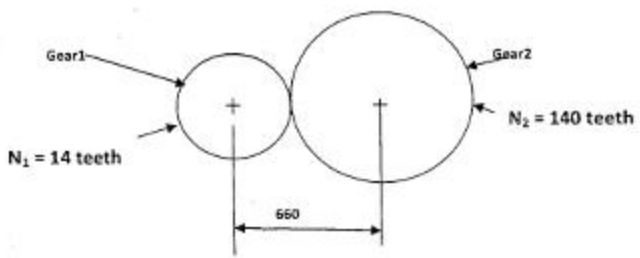


	$E_{ss} = 2 \times 10^5$ N/ mm^2, $E_c = 1 \times 10^5$ N/ mm^2, $A_{ss} = 600$ mm^2, $A_c = 200$ mm^2
	a) $\sigma_c = 20$ (Compressive), $\sigma_{ss} = 30$ (Tensile) **b)** $\sigma_c = 30$ (Compressive), $\sigma_{ss} = 20$ (Tensile)
	c) $\sigma_c = 30$ (Tensile), $\sigma_{ss} = 20$ (Compressive) **d)** $\sigma_c = 30$ (Tensile), $\sigma_{ss} = 20$ (Tensile)
57	A short column of external diameter D and internal diameter d is subjected to a compressive load P acting with an eccentricity 'e'. If the stresses at one of the extreme fibre is zero then the eccentricity has to be



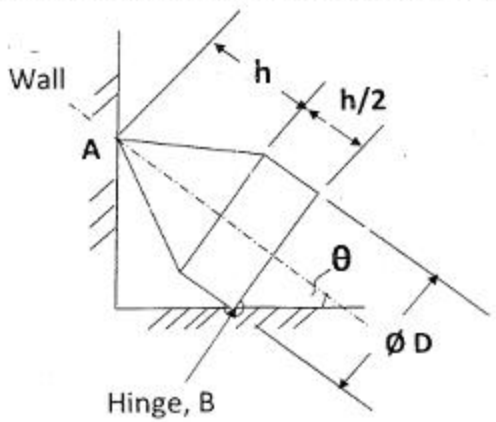
	(a) $\frac{D^2 + d^2}{8\pi D}$	b) $\frac{D^2 + d^2}{8D}$	c) $\frac{D^2 - d^2}{8D}$	d) $\frac{D^3 - d^3}{8D^2}$
58	The number of degrees of freedom in the 3 link mechanism shown below is given by			



	(a) 1	(b) 2	(c) 3	(d) 0
59	The equation of motion for a damped vibration is given by $6\ddot{x} + 9\dot{x} + 27x = 0$. The damping factor will be			
	(a) 0.25	(b) 0.5	(c) 0.35	(d) 0.75
60	A block brake with 400 mm diameter is used to brake a torque of 100 Nm as shown in the figure. If the coefficient friction is 0.25 at the brake surface what is the value of force F to be applied at the end of the lever. 			
	(a) 559.4 N	(b) 579.4 N	(c) 439.4 N	(d) 1000 N
61	In the gear train of 1:10 as shown in the figure the pinion transmits 250 kw at 1800 rpm. What is the tangential load on the gear tooth 			
	(a) 221 kN	(b) 22.1 kN	(c) 25.1 kN	(d) 251 kN

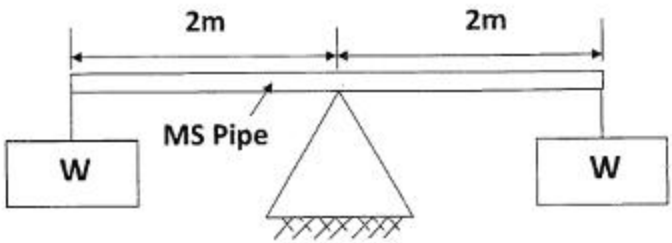
62	Spring back in metal forming depends on			
	(a) Modulus of Elasticity		(b) Load Applied	
	(c) Strain Rate		(d) None of these	
63	Which of the following processes induce more stress in the metal ?			
	(a) Hot rolling	(b) Forging	(c) Swaging	(d) Turning
64	The essential ingredient of any hardened steel is			
	(a) Austenite	(b) Pearlite	(c) Martensite	(d) Cementite
65	Following is a process used to form powder metal to shape			
	(a) Sintering	(b) Explosive Compacting	(c) Isostatic Molding	(d) All of these
66	A titanium sheet of 5.0 mm thickness is cut by wire-cut EDM process using a wire of 1.0 mm diameter. A uniform spark gap of 0.5 mm on both sides of the wire is maintained during cutting operation. If the feed rate of the wire into the sheet is 20 mm/min, the materia! removal rate(in mm^3/min) will be			
	(a) 150	(b) 200	(c) 300	(d) 400
67	Diamond cutting tools are not recommended for machining of ferrous metals due to			
	(a) high tool hardness	(b) chemical affinity of tool material with iron	(c) Poor tool toughness	(d) High Thermal conductivity of work material
68	During the execution of a CNC part program block N020 G02 X45.0 Y25.0 R5.0 the type of tool motion will be			
	(a) circular Interpolation – clockwise	(b) Circular Interpolation – Counter clockwise	(c) Linear Interpolation	(d) Rapid Feed
69	Projection Welding is a			
	(a) Continuous Spot Welding Process	(b) multi-spot welding process	(c) Arc Welding Process	(d) Process used for joining round bars
70	In a single point turning operation with a cemented carbide and steel combination having a Taylor exponent of 0.25, if the cutting speed is halved, then tool life will become			

	(a) half	(b) sixteen times	(c) Two Times	(d) Eight times
71	An oxidising process used for aluminium and magnesium articles is called			
	(a) galvanising	(b) Anodising	(c) Parkerising	(d) Sheradising
72.	One of the characteristics of Polymer is			
	(a) high Temperature Stability	(b) High Mechanical Strength	(c)High Elongation	(d) Low Hardness
73	Usually Materials with the following crystal structure fail in ductile mode			
	(a) FCC	(b) BCC	(c) HCP	(d) None of these
74	Work hardening strengthens an alloy by			
	(a) Removing Internal defects in the crystal structure		(b) increasing the dislocation density	
	(c) Decreasing the grain size of the alloy		(d) Increasing the lattice resistance to dislocation motion	
75	An Aluminium object is made of a solid cone of height 'h' and base diameter D attached to a solid cylinder of diameter D and height 'h/2' as shown in figure. It is kept inclined touching to a vertical wall at point 'A' and hinged at point B on the floor. The object stays in this inclined position without going to vertical position (axis perpendicular to the floor), only if θ is less than			
	a) Tan^{-1} (10 D/9h)		b) $\pi/2 - Sin^{-1}$ (10 D/h)	
	c) $\pi/2 - Tan^{-1}$ (10 D/9h)		d) Tan^{-1} (20 D/9h)	



76 A hollow MS pipe is kept on a smooth straight edge with the pipe mid point sitting on it. A load 'W' Newtons is applied at the ends which is keeping the pipe balanced in the horizontal condition. what is the safe maximum load 'W' that can be applied without yielding the tube. Consider the self weight of the tube as 'p' N/m.

Diameter of the pipe is 'd', Youngs modulus of pipe is E, Allowable yield stress is σ



a)	$(\sigma \pi d^4 - 64 p)/(64 E)$	b) $(\sigma \pi d^4 - 32 p)/(32 E)$
c)	$(\sigma \pi d^3 + 64 p)/64$	d) $(\sigma \pi d^3 - 64 p)/64$

77 A car crashes against a wall. The initial velocity at collision is 15m/sec and the velocity after collision is 2.6m/sec in the opposite direction. The mass of the car is 1500kg. what is the average force exerted on the automobile bumper if collision lasts for 0.15 seconds.

a) 1.76×10^4 N	b) 2.1×10^5 N	c) 2.76×10^5 N	d) None of these

78 Differential equation for the variation of amount of salt 'x' in a tank is given by :

$(dx/dt) + (x/20) = 10$. where x is in kg and t is in minutes. Assuming that at time zero there is no salt in the tank, find the time at which the amount of salt increases to 100kg

a) 100 ln 2	b) 50 ln 2	c) 20 ln 2	d) 10 ln 2

79 A 5 mm diameter aluminium alloy test bar is subjected to a load of 500 N. if the diameter of the bar at this load is 4 mm, the true strain is

a) 0.56	(b) 0.22	c) 0.25	(d) 0.45

80 A material is dimensionally stable at room temperature if its glass transition temperature (T_g) is

a) Below room temperature	(b) Just Above room temperature	(c) Equal to room temperature	(d) Well above room temperature

1 The encoding technique used to transmit the signal in giga ethernet technology over fiber optic medium is
- a Differential manchester encoding
- b Non Return to zero
- c 4B/5B encoding
- d 8B/10B encoding

2 Which of the following is an unsupervised neural network
- a RBS
- b Hopfield
- c Back propagation
- d Kohonen

3 In compiler terminology, reduction in strength means
- a Replacing run time computation by compile time computation
- b Removing loop invariant computation
- c Removing common subexpressions
- d Replacing a costly operation by a relatively cheaper one

4 The following table shows the processes in the ready queue and time required for each process for completing its job.

Process	Time (ms)
P_1	10
P_2	5
P_3	20
P_4	8
P_5	15

If round robin scheduling with 5ms is used what is the average waiting time of the processes in the queue?
- a 27 ms
- b 26.2 ms
- c 27.5 ms
- d 27.2 ms

5 MOV [BX], AL type of data addressing is called
- a Register addressing
- b Immediate addressing
- c Register indirect addressing
- d Register relative

6 Evaluate (X xor Y) xor Y
- a All 1's
- b All 0's
- c X
- d Y

7 Which of the following is true about the z-buffer algorithm?
- a It is a depth sort algorithm
- b No limitation on total number of objects in the scene
- c Comparison of objects is done
- d z-buffer is initialized to background colour at start of algorithm

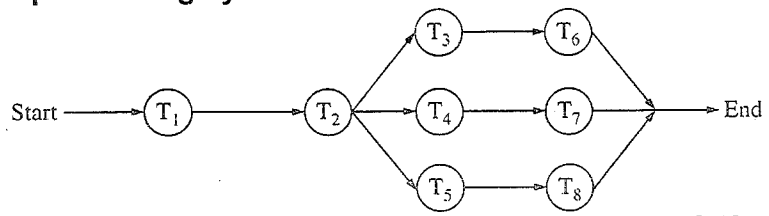
8 What is the decimal value of the floating-point number C1D00000 (hexadecimal notation)? (Assume 32-bit, single precision floating point IEEE representation)

a 28
b -15
c -26
d -28

9 What is the raw throughput of USB 2.0 technology?

a 480 Mbps
b 400 Mbps
c 200 Mbps
d 12 Mbps

10 Below is the precedence graph for a set of tasks to be executed on a parallel processing system *S*.



What is the efficiency of this precedence graph on *S* if each of the tasks *T*1, . . . , *T*8 takes the same time and the system S has five processors?

a 25%
b 40%
c 50%
d 90%

11 How many distinct binary search trees can be created out of 4 distinct keys?

a 5
b 14
c 24
d 35

12 The network protocol which is used to get MAC address of a node by providing IP address is

a SMTP
b ARP
c RIP
d BOOTP

13 Which of the following statements about peephole optimizations is False?

a It is applied to a small part of the code
b It can be used to optimize intermediate code
c To get the best out of this, it has to be applied repeatedly
d It can be applied to a portion of the code that is not contiguous

14 Which one of the following in place sorting algorithms needs the minimum number of swaps?

a Quick-sort
b Insertion sort
c Selection sort
d Heap sort

15 What is the equivalent serial schedule for the following transactions?

Transaction

T_1	T_2	T_3
		R(Y)
		R(Z)
R(X)		
W(X)		
		W(Y)
		W(Z)
	W(Z)	
R(Y)		
W(Y)		
	R(Y)	
	W(Y)	
	R(X)	
	W(X)	

a T_1-T_2-T_3
b T_3-T_1-T_2
c T_2-T_1-T_3
d T_1-T_3-T_2

16 Consider a direct mapped cache with 64 blocks and a block size of 16 bytes. To what block number does the byte address 1206 map to?

a Does not map
b 6
c 11
d 54

17 A context model of a software system can be shown by drawing a

a LEVEL-0 DFD
b LEVEL-1 DFD
c LEVEL-2 DFD
d LEVEL-3 DFD

18 An example of poly-alphabetic substitution is

a P-box
b S-box
c Caesar cipher
d Vigenere cipher

19 If node A has three siblings and B is parent of A, what is the degree of A?
- a 0
- b 3
- c 4
- d 5

20 The IEEE standard for WiMax technology is
- a IEEE 802.16
- b IEEE 802.36
- c IEEE 812.16
- d IEEE 806.16

21 Which type of DBMS provides support for maintaining several versions of the same entity?
- a Relational Data Base Management Systems
- b Hierarchical
- c Object Oriented Data Base Management Systems
- d Network

22 A system is having 8 M bytes of video memory for bit-mapped graphics with 64-bit colour. What is the maximum resolution it can support?
- a 800 x 600
- b 1024 x 768
- c 1280 x 1024
- d 1920 x 1440

23 What is the meaning of $\overline{RD}$ signal in Intel 8151A?
- a Read (when it is low)
- b Read (when it is high)
- c Write (when it is low)
- d Read and Write (when it is high)

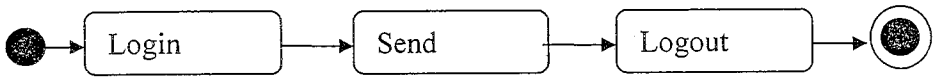
24 If the page size in a 32-bit machine is 4K bytes then the size of page table is
- a 1 M bytes
- b 2 M bytes
- c 4 M bytes
- d 4 K bytes

25 A processor takes 12 cycles to complete an instruction I. The corresponding pipelined processor uses 6 stages with the execution times of 3,2,5,4,6 and 2 cycles respectively. What is the asymptotic speedup assuming that a very large number speedup assuming that a very large number of instructions are to be executed?
- a 1.83
- b 2
- c 3
- d 6

26 The in-order traversal of a tree resulted in FBGADCE. Then the pre-order traversal of that tree would result in
- a FGBDECA
- b ABFGCDE
- c BFGCDEA
- d AFGBDEC

27 **Which one of the following is 'true'**
- a $R \cap S = (R \cup S) - [(R-S) \cup (S-R)]$
- b $R \cup S = (R \cap S) - [(R-S) \cup (S-R)]$
- c $R \cap S = (R \cup S) - [(R-S) \cap (S-R)]$
- d $R \cap S = (R \cup S) \cup (R-S)$

28



The above figure represents which one of the following UML diagram for a single send session of an online chat system.
- a Package Diagram
- b Activity Diagram
- c Class Diagram
- d Sequence Diagram

29 **Which 'Normal Form' is based on the concept of 'full functional dependency' is**
- a First Normal Form
- b Second Normal Form
- c Third Normal Form
- d Fourth Normal Form

30 **In Boolean algebra, rule (X+Y)(X+Z) =**
- a Y+XZ
- b X + YZ
- c XY+Z
- d XZ + Y

31 **How many 3-to-8 line decoders with a chip having enable pin are needed to construct a 6-to-64 line decoder without using any other logic gates?**
- a 7
- b 8
- c 9
- d 10

32 **In which layer of network architecture, the secured socket layer (SSL) is used?**
- a physical layer
- b session layer
- c application layer
- d presentation layer

33 What is the bit rate of a video terminal unit with 80 character/line, 8 bits/charcter and horizontal sweep time of 100 μs (including 20 μs of retrace time)?
- a 8 Mbps
- b 6.4 Mbps
- c 0.8 Mbps
- d 0.64 Mbps

34 Black Box software testing method focuses on the
- a Boundary condition of the software
- b Control Structure of the Software
- c Functional Requirement of the Software
- d Independent paths of the software

35 How many edges are there in a forest with v vertices and k components?
- a (v+1) - k
- b (v+1)/2 - k
- c v - k
- d v + k

36 If A and B are square matrices of the same order and A is symmetric, then B^TAB is
- a Skew symmetric
- b Symmetric
- c Orthogonal
- d Idempotent

37 Find the memory address of the next instruction executed by the microprocessor (8086), when operated in real mode for CS = 1000 and IP = E000
- a 10E00
- b 1E000
- c F000
- d 1000E

38 A fast wide SCSI-II disk drive spins at 7200 RPM, has a sector size of 512 bytes, and holds 160 sectors per track. Estimate the sustained transfer rate of this drive.
- a 576000 Kilobytes / sec
- b 9600 Kilobytes / sec
- c 4800 Kilobytes / sec
- d 19200 Kilobytes / sec

39 Two control signals in microprocessor which are related to Direct Memory Access (DMA) are
- a INTR & INTA
- b RD & WR
- c S0 & S1
- d HOLD & HLDA

40 Consider the following pseudocode.

```
x := 1;
i := 1;
while (x ≤ 500)
begin
        x := 2^x ;
        i := i + 1;
end;
```

What is the value of i at the end of the pseudocode?

a 4
b 5
c 6
d 7

41 If a microcomputer operates at 5 MHz with an 8-bit bus and a newer version operates at 20 MHz with a 32-bit bus, the maximum speed-up possible approximately will be

a 2
b 4
c 8
d 16

42 The search concept used in associative memory is

a Parallel search
b Sequential search
c Binary search
d Selection search

43 Which variable does not drive a terminal string in the grammar

```
S -> AB
A -> a
B -> b
B -> C
```

a A
b B
c C
d S

44 In Java, after executing the following code what are the values of x, y and z?

```
int x,y = 10, z = 12;
x = y++ + z++;
```

a x = 22, y=10, z=12
b x = 24, y=10, z=12
c x = 24, y=11, z=13
d x = 22, y=11, z=13

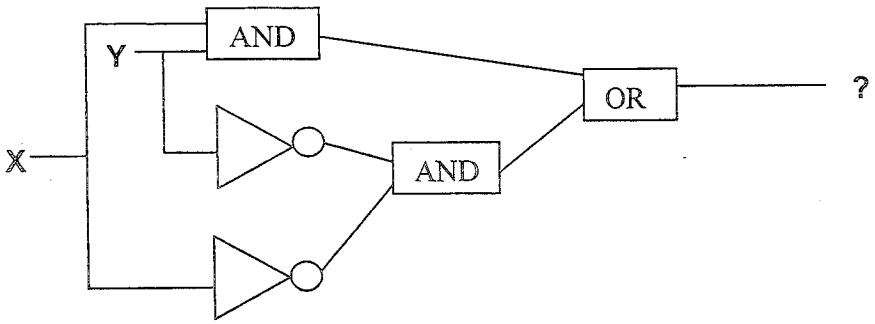
45 The broadcast address for IP network 172.16.0.0 with subnet mask 255.255.0.0 is

a 172.16.0.255
b 172.16.255.255
c 255.255.255.255
d 172.255.255.255

46 Which RAID level gives block level striping with double distributed parity

a RAID 10
b RAID 2
c RAID 6
d RAID 5

47 The output expression of the following gate network is



a $X.Y + \overline{X}.\overline{Y}$
b X.Y+ X.Y
c X.Y
d X+Y

48 The Hamming distance between the octets of 0xAA and 0x55 is

a 7
b 5
c 8
d 6

49 Consider a 32-bit machine where four-level paging scheme is used. If the hit ratio to TLB is 98%, and it takes 20 nanoseconds to search the TLB and 100 nanoseconds to access the main memory what is effective memory access time in nanoseconds?

a 126
b 128
c 122
d 120

50 Data is transmitted continuously at 2.048 Mbps rate for 10 hours and received 512 bit errors. What is the bit error rate?
- a 6.9 e-9
- b 6.9 e-6
- c 69 e-9
- d 4 e-9

51 Warnier Diagram enables the analyst to represent
- a Class Structure
- b Information Hierarchy
- c Data Flow
- d State Transition

52 Given

X :	0	10	16
Y :	6	16	28

The interpolated value at X = 4 using piecewise linear interpolation is
- a 11
- b 4
- c 22
- d 10

53 In functional dependency, Armstrong's inference rules refers to
- a Reflexive, Augmentation and Decomposition
- b Transitive, Augmentation and Reflexive
- c Augmentation, Transitive, Reflexive and Decomposition
- d Reflexive, Transitive and Decomposition

54 Number of chips (128 x 8 RAM) needed to provide a memory capacity of 2048 bytes
- a 2
- b 4
- c 8
- d 16

55 There are three processes in the ready queue. When the currently running process requests for I/O how many process switches take place?
- a 1
- b 2
- c 3
- d 4

56 Let $T(n)$ be defined by $T(1) = 10$ and $T(n+1) = 2n + T(n)$ for all integers $n \geq 1$. Which of the following represents the order of growth of $T(n)$ as a function of n ?
- a $O(n)$
- b $O(n \log n)$
- c $O(n^2)$
- d $O(n^3)$

57 Which of the following UNIX command allows scheduling a program to be executed at the specified time?

a cron
b nice
c date and time
d schedule

58 In DMA transfer scheme, the transfer scheme other than burst mode is

a cycle technique
b stealing technique
c cycle stealing technique
d cycle bypass technique

59 n^{th} derivative of x^n is

a nx^{n-1}
b $n^n . n!$
c $nx^n!$
d n!

60 A total of 9 units of a resource type are available, and given the safe state shown below, which of the following sequence will be a safe state?

Process	Used	Max
P_1	2	7
P_2	1	6
P_3	2	5
P_4	1	4

a $<P_4, P_1, P_3, P_2>$
b $<P_4, P_2, P_1, P_3>$
c $<P_4, P_2, P_3, P_1>$
d $<P_3, P_1, P_2, P_4>$

61 Three coins are tossed simultaneously. The probability that they will fall two heads and one tail is

a 5/8
b 1/8
c 2/3
d 3/8

62 The average depth of a binary search tree is

a $O(n^{0.5})$
b O(n)
c O(log n)
d O(n log n)

63 What is the output of the following C code?

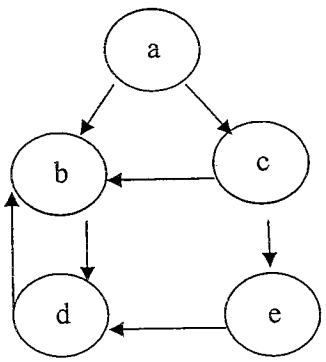
```
#include <stdio.h>
#include <conio.h>

void main()
{
        int index;

        for(index=1; index<=5;i++)
        {
                printf("%d",index);
                if(i == 3)
                        continue;
        }
}
```

a 1245
b 12345
c 12245
d 12354

64 When n-type semiconductor is heated ?

a number of electrons increases while that of holes decreases
b number of holes increases while that of electrons decreases
c number of electrons and holes remain same
d number of electron and holes increases equally.

65 The Cyclomatic Complexity metric V(G) of the following control flow graph is



a 3
b 4
c 5
d 6

66 Which of the following algorithm design techniques is used in merge sort?
- a Greedy method
- b Backtracking
- c Dynamic programming
- d Divide and Conquer

67 The arithmetic mean of attendance of 49 students of class A is 40% and that of 53 students of class B is 35%. Then the % of arithmetic mean of attendance of class A and B is
- a 27.2%
- b 50.25%
- c 51.13%
- d 37.4%

68 Which of the following sentences can be generated by

S -> aS | bA
A -> d | cA
- a bccdd
- b abbcca
- c abcabc
- d abcd

69 Lightweight Directory Access Protocol is used for
- a Routing the packets
- b Authentication
- c obtaining IP address
- d domain name resolving

70 Number of comparisons required for an unsuccessful search of an element in a sequential search organized, fixed length, symbol table of length L is
- a L
- b L/2
- c (L+1)/2
- d 2L

71 One SAN switch has 24 ports. All 24 port supports 8 Gbps Fiber Channel technology. What is the aggregate bandwidth of that SAN switch ?
- a 96 Gbps
- b 192 Mbps
- c 512 Gbps
- d 192 Gbps

72 Find the output of the following Java code line

System.out.println(math.floor(-7.4))
- a -7
- b -8
- c -7.4
- d -7.0

73 **Belady's anomaly means**

a Page fault rate is constant even on increasing the number of allocated frames

b Pages fault rate may increase on increasing the number of allocated frames

c Pages fault rate may increase on decreasing the number of allocated frames

d Pages fault rate may decrease on increasing the number of allocated frames

74 **In an RS flip-flop, if the S line (Set line) is set high (1) and the R line (Reset line) is set low (0), then the state of the flip flop is**

a Set to 1

b Set to 0

c No change in state

d Forbidden

75 **In HTML, which of the following can be considered a container?**

a <SELECT>

b <Value>

c <INPUT>

d <BODY>

76 **What is the matrix that represents rotation of an object by θ^0 about the origin in 2D?**

a $\begin{matrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{matrix}$

b $\begin{matrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{matrix}$

c $\begin{matrix} \cos\theta & -\sin\theta \\ \cos\theta & \sin\theta \end{matrix}$

d $\begin{matrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{matrix}$

77 **In a system having a single processor, a new process arrives at the rate of six processes per minute and each such process requires seven seconds of service time. What is the CPU utilization?**

a 70%

b 30%

c 60%

d 64%

78 **A symbol table of length 152 is possessing 25 entries at any instant. What is occupation density?**

a 0.164

b 127

c 8.06

d 6.08

79 A problem whose language is recursion is called ?
- a Unified problem
- b Boolean function
- c Recursive problem
- d Decidable

80 Logic family popular for low power dissipation
- a CMOS
- b ECL
- c TTL
- d DTL

1	Let A(1:8, -5:5, -10:5) be a three dimensional array. How many elements are there in the array A?	
	a	1200
	b	1408
	c	33
	d	1050
2	The number of rotations required to insert a sequence of elements 9,6,5,8,7,10 into an empty AVL tree is?	
	a	0
	b	1
	c	2
	d	3
3	Opportunistic reasoning is addressed by which of the following knowledge representation	
	a	Script
	b	Blackboard
	c	Production Rules
	d	Fuzzy Logic
4	The following steps in a linked list p = getnode() info (p) = 10 next (p) = list list = p result in which type of operation?	
	a	pop operation in stack
	b	removal of a node
	c	inserting a node
	d	modifying an existing node
5	Shift reduce parsing belongs to a class of	
	a	bottom up parsing
	b	top down parsing
	c	recursive parsing
	d	predictive parsing
6	Which of the following productions eliminate left recursion in the productions given below: $S \rightarrow Aa \mid b$ $A \rightarrow Ac \mid Sd \mid \varepsilon$	
	a	$S \rightarrow Aa \mid b$, $A \rightarrow bdA'$, $A' \rightarrow A'c \mid A'ba \mid A \mid \varepsilon$
	b	$S \rightarrow Aa \mid b$, $A \rightarrow A' \mid bdA'$ $A' \rightarrow cA' \mid adA' \mid \varepsilon$
	c	$S \rightarrow Aa \mid b$, $A \rightarrow A'c \mid A'd$ $A' \rightarrow bdA' \mid cA \mid \varepsilon$
	d	$S \rightarrow Aa \mid b$, $A \rightarrow cA' \mid adA' \mid bdA'$ $A' \rightarrow A \mid \varepsilon$

7	Consider the following psuedocode: x : integer := 1 y : integer := 2 procedure add x := x + y procedure second (P: procedure) x : integer := 2 P() procedure first y : integer := 3 second(add) first() write_integer (x) What does it print if the language uses dynamic scoping with deep binding?	
	a	2
	b	3
	c	4
	d	5
8	Which logic gate is used to detect overflow in 2's complement arithmetic?	
	a	OR gate
	b	AND gate
	c	NAND gate
	d	XOR gate
9	In an array of 2N elements that is both 2-ordered and 3-ordered, what is the maximum number of positions that an element can be from its position if the array were 1-ordered?	
	a	1
	b	2
	c	N/2
	d	2N-1
10	If the frame buffer has 8 bits per pixel and 8 bits are allocated for each of the R, G, B components, what would be the size of the lookup table?	
	a	24 bytes
	b	1024 bytes
	c	768 bytes
	d	256 bytes

11	When two BCD numbers 0x14 and 0x08 are added what is the binary representation of the resultant number?	
	a	0x22
	b	0x1c
	c	0x16
	d	results in overflow
12	Which of the following sorting algorithms has the minimum running time complexity in the best and average case?	
	a	Insertion sort, Quick sort
	b	Quick sort, Quick sort
	c	Quick sort, Insertion sort
	d	Insertion sort, Insertion sort
13	The number 1102 in base 3 is equivalent to 123 in which base system?	
	a	4
	b	5
	c	6
	d	8
14	A processor is fetching instructions at the rate of 1 MIPS. A DMA module is used to transfer characters to RAM from a device transmitting at 9600 bps. How much time will the processor be slowed down due to DMA activity?	
	a	9.6 ms
	b	4.8 ms
	c	2.4 ms
	d	1.2 ms
15	A pipeline P operating at 400 MHz has a speedup factor of 6 and operating at 70% efficiency. How many stages are there in the pipeline?	
	a	5
	b	6
	c	8
	d	9
16	How much speed do we gain by using the cache, when cache is used 80% of the time? Assume cache is faster than main memory.	
	a	5.27
	b	2.00
	c	4.16
	d	6.09

17	Two eight bit bytes 1100 0011 and 0100 1100 are added. What are the values of the overflow, carry and zero flags respectively, if the arithmetic unit of the CPU uses 2's complement form?	
	a	0, 1, 1
	b	1, 1, 0
	c	1, 0, 1
	d	0, 1, 0
18	How many check bits are required for 16 bit data word to detect 2 bit errors and single bit correction using hamming code?	
	a	5
	b	6
	c	7
	d	8
19	What is the maximum number of characters (7 bits + parity) that can be transmitted in a second on a 19.2 kbps line. This asynchronous transmission requires 1 start bit and 1 stop bit.	
	a	192
	b	240
	c	1920
	d	1966
20	IEEE 1394 is related to	
	a	RS-232
	b	USB
	c	Firewire
	d	PCI
21	What will be the cipher text produced by the following cipher function for the plain text ISRO with key k =7. [Consider 'A' = 0, 'B' = 1, ...'Z' = 25] $C_k(M) = (kM + 13) \bmod 26$	
	a	RJCH
	b	QIBG
	c	GQPM
	d	XPIN
22	Any set of boolean operators that is sufficient to represent all boolean expressions is said to be complete. Which of the following is not complete?	
	a	{NOT, OR}
	b	{NOR}
	c	{AND, OR}
	d	{AND, NOT}

23	Which of the following is the highest isolation level in transaction management?	
	a	Serializable
	b	Repeated Read
	c	Committed Read
	d	Uncommitted Read
24	Consider the following relational schema: Suppliers (sid:integer, sname:string, saddress:string) Parts (pid:integer, pname:string, pcolor:string) Catalog (sid:integer, pid:integer, pcost:real) What is the result of the following query? (SELECT Catalog.pid from Suppliers, Catalog WHERE Suppliers.sid = Catalog.pid) MINUS (SELECT Catalog.pid from Suppliers, Catalog WHERE Suppliers.sname <> 'sachin' and Suppliers.sid = Catalog.sid)	
	a	pid of Parts supplied by all except sachin
	b	pid of Parts supplied only by sachin
	c	pid of Parts available in catalog supplied by sachin
	d	pid of Parts available in catalogs supplied by all except scahin
25	Consider the following dependencies and the BOOK table in a relational database design. Determine the normal form of the given relation. ISBN → Title ISBN → Publisher Publisher → Address	
	a	First Normal Form
	b	Second Normal Form
	c	Third Normal Form
	d	BCNF
26	Calculate the order of leaf(p_{leaf}) and non leaf(p) nodes of a B^+ tree based on the information given below Search key field = 12 bytes Record pointer = 10 bytes Block pointer = 8 bytes Block size = 1 KB	
	a	p_{leaf} = 51 & p = 46
	b	p_{leaf} = 47 & p = 52
	c	p_{leaf} = 46 & p = 51
	d	p_{leaf} = 52 & p = 47

27	The physical location of a record determined by a formula that transforms a file key into a record location is	
	a	Hashed file
	b	B-Treé file
	c	Indexed file
	d	Sequential file
28	The most simplified form of the boolean function x (A,B,C,D) = Σ (7,8,9,10,11,12,13,14,15) (expressed in sum of minterms) is?	
	a	A + A'BCD
	b	AB + CD
	c	A + BCD
	d	ABC + D
29	How many programmable fuses are required in a PLA which takes 16 inputs and gives 8 outputs? It has to use 8 OR gates and 32 AND gates.	
	a	1032
	b	776
	c	1284
	d	1536
30	In a three stage counter, using RS flip flops what will be the value of the counter after giving 9 pulses to its input? Assume that the value of counter before giving any pulses is 1.	
	a	1
	b	2
	c	9
	d	10
31	In which of the following shading models of polygons, the interpolation of intensity values is done along the scan line?	
	a	Gourard shading
	b	Phong shading
	c	Constant shading
	d	Flat shading
32	Which of the following number of nodes can form a full binary tree?	
	a	8
	b	15
	c	14
	d	13

33	What is the matrix transformation which takes the independent vectors $\begin{bmatrix}1\\2\end{bmatrix}$ and $\begin{bmatrix}2\\5\end{bmatrix}$ and transforms them to $\begin{bmatrix}1\\1\end{bmatrix}$ and $\begin{bmatrix}3\\2\end{bmatrix}$ respectively?	
	a	$\begin{bmatrix}1 & -1\\1 & 0\end{bmatrix}$
	b	$\begin{bmatrix}0 & 0\\0.5 & 0.5\end{bmatrix}$
	c	$\begin{bmatrix}-1 & 0\\1 & 1\end{bmatrix}$
	d	$\begin{bmatrix}-1 & 1\\1 & 0\end{bmatrix}$
34	In 8086, the jump condition for the instruction JNBE is?	
	a	CF = 0 or ZF = 0
	b	ZF = 0 and SF = 1
	c	CF = 0 and ZF = 0
	d	CF = 0
35	How many number of times the instruction sequence below will loop before coming out of the loop? MOV AL, 00H A1: INC AL JNZ A1	
	a	1
	b	255
	c	256
	d	Will not come out of the loop
36	In 8085 microprocessor, the ISR for handling trap interrupt is at which location?	
	a	3CH
	b	34H
	c	74H
	d	24H

37	**The voltage ranges for a logic high and a logic low in RS-232 C standard is**	
	a	Low is 0.0V to 1.8V, High is 2.0V to 5.0V
	b	Low is -15.0V to -3.0V, High is 3.0V to 15.0V
	c	Low is 3.0V to 15.0V, High is -3.0V to -15.0V
	d	Low is 2.0V to 5.0V, High is 0.0V to 1.8V
38	**In the Ethernet, which field is actually added at the physical layer and is not part of the frame**	
	a	preamble
	b	CRC
	c	address
	d	location
39	**Ethernet layer-2 switch is a network element type which gives**	
	a	different collision domain and same broadcast domain
	b	different collision domain and different broadcast domain
	c	same collision domain and same broadcast domain
	d	same collision domain and different broadcast domain
40	**If the frame to be transmitted is 1101011011 and the CRC polynomial to be used for generating checksum is $x^4 + x + 1$, then what is the transmitted frame?**	
	a	11010110111011
	b	11010110111101
	c	11010110111110
	d	11010110111001
41	**What will be the efficiency of a Stop and Wait protocol, if the transmission time for a frame is 20ns and the propagation time is 30ns?**	
	a	20%
	b	25%
	c	40%
	d	66%
42	**IPv6 does not support which of the following addressing modes?**	
	a	unicast addressing
	b	multicast addressing
	c	broadcast addressing
	d	anycast addressing
43	**What is IP class and number of sub-networks if the subnet mask is 255.224.0.0?**	
	a	class A, 3
	b	class A, 8
	c	class B, 3
	d	class B, 32

44	**Which algorithm is used to shape the bursty traffic into a fixed rate traffic by averaging the data rate?**	
	a	solid bucket algorithm
	b	spanning tree algorithm
	c	hocken helm algorithm
	d	leaky bucket algorithm
45	**A packet filtering firewall can**	
	a	deny certain users from accessing a service
	b	block worms and viruses from entering the network
	c	disallow some files from being accessed through FTP
	d	block some hosts from accessing the network
46	**Which of the following encryption algorithms is based on the Fiestal struture?**	
	a	Advanced Encryption Standard
	b	RSA public key cryptographic algorithm
	c	Data Encryption Standard
	d	RC4
47	**The protocol data unit for the transport layer in the internet stack is**	
	a	segment
	b	message
	c	datagram
	d	frame
48	**The Guass-Seidal iterative method can be used to solve which of the following sets?**	
	a	Linear algebraic equations
	b	Linear and non-linear algebraic equations
	c	Linear differential equations
	d	Linear and non-linear differential equations
49	**What is the least value of the function $f(x) = 2x^2 - 8x - 3$ in the interval [0 , 5] ?**	
	a	-15
	b	7
	c	-11
	d	-3

50 Consider the following set of processes, with arrival times and the required CPU-burst times given in milliseconds.

Process	Arrival Time	Burst Time
P1	0	4
P2	2	2
P3	3	1

What is the sequence in which the processes are completed? Assume round robin scheduling with a time quantum of 2 milliseconds.

a. P1, P2, P3
b. P2, P1, P3
c. P3, P2, P1
d. P2, P3, P1

51 In case of a DVD, the speed of data transfer is mentioned in multiples of?

a. 150 KB/s
b. 1.38 MB/s
c. 300 KB/s
d. 2.40 MB/s

52 Suppose we have variable logical records of lengths of 5 bytes, 10 bytes, and 25 bytes while the physical block size in disk is 15 bytes. What is the maximum and minimum fragmentation seen in bytes?

a. 25 and 5
b. 15 and 5
c. 15 and 0
d. 10 and 5

53 A CPU scheduling algorithm determines an order for the execution of its scheduled processes. Given 'n' processes to be scheduled on one processor, how many possible different schedules are there?

a. n
b. n^2
c. n!
d. 2^n

54 Which of the following are the likely causes of thrashing?

a. Page size was very small
b. There are too many users connected to the system
c. Least recently used policy is used for page replacement
d. First in First out policy is used for page replacement

55	Consider a logical address space of 8 pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the physical address and logical address respectively?	
	a	5, 3
	b	10, 10
	c	15, 13
	d	15, 15
56	In a 64-bit machine, with 2 GB RAM, and 8 KB page size, how many entries will be there in the page table if it is inverted?	
	a	2^{18}
	b	2^{20}
	c	2^{33}
	d	2^{51}
57	Which of the following is not a necessary condition for deadlock?	
	a	Mutual exclusion
	b	Reentrancy
	c	Hold and wait
	d	No pre-emption
58	Consider the following process and resource requirement of each process.	

Process	Type 1		Type 2	
	Used	Max	Used	Max
P1	1	2	1	3
P2	1	3	1	2
P3	2	4	1	4

	Predict the state of this system, assuming that there are a total of 5 instances of resource type 1 and 4 instances of resource type 2.	
	a	Can go to safe or unsafe state based on sequence
	b	Safe state
	c	Unsafe state
	d	Deadlock state
59	A starvation free job scheduling policy guarantees that no job indefinitely waits for a service. Which of the following job scheduling policies is starvation free?	
	a	Priority queing
	b	Shortest Job First
	c	Youngest Job First
	d	Round robin

60	**The state of a process after it encounters an I/O instruction is**	
	a	ready
	b	blocked
	c	idle
	d	running
61	**Embedded pointer provides**	
	a	a secondary access path
	b	a physical record key
	c	an inverted index
	d	a prime key
62	**A particular parallel program computation requires 100 seconds when executed on a single CPU. If 20% of this computation is strictly sequential, then theoretically the best possible elapsed times for this program running on 2 CPUs and 4 CPUs respectively are**	
	a	55 and 45 seconds
	b	80 and 20 seconds
	c	75 and 25 seconds
	d	60 and 40 seconds

63	**Consider the following C code.**
	
	#include <stdio.h>
	#include <math.h>
	void main()
	{
	double pi = 3.1415926535;
	int a = 1;
	int i;
	
	for(i=0; i < 3; i++)
	if(a = cos(pi * i/2))
	printf("%d ",1);
	else printf("%d ", 0);
	}
	
	What would the program print?	

	a	0 0 0
	b	0 1 0
	c	1 0 1
	d	1 1 1

64 What is the output of the following Java program?

```
Class Test
{
    public static void main (String [] args)
    {
        int x = 0;
        int y = 0;

        for (int z = 0; z < 5; z++)
        {
            if((++x > 2) || (++y > 2))
            {
                x++;
            }
        }
        System.out.println( x + " " + y);
    }
}
```

	a	8 2
	b	8 5
	c	8 3
	d	5 3

65 Consider the list of page references in the time line as below:
9 6 2 3 4 4 4 4 3 4 4 2 5 8 6 8 5 5 3 2 3 3 9 6 2 7
What is the working set at the penultimate page reference if Δ is 5?

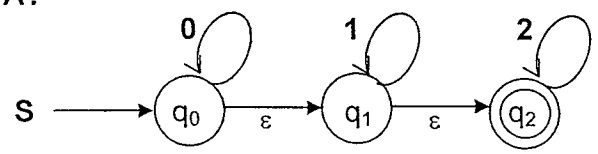
	a	{8,5,3,2,9,6}
	b	{4,3,6,2,5}
	c	{3,9,6,2,7}
	d	{3,9,6,2}

66 What is the cyclomatic complexity of a module which has seventeen edges and thirteen nodes?

	a	4
	b	5
	c	6
	d	7

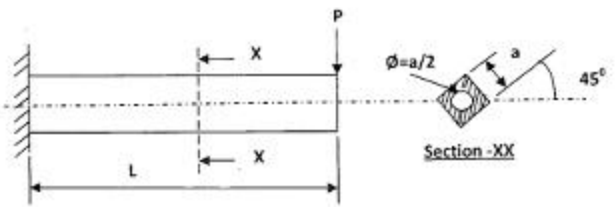
67 Which of the following types of coupling has the weakest coupling?

	a	Pathological coupling
	b	Control coupling
	c	Data coupling
	d	Message coupling

68	**Which of the following testing methods uses fault simulation technique?**	
	a	unit testing
	b	beta testing
	c	stress testing
	d	mutation testing
69	**If a program P calls two subprograms P1 and P2 and P1 can fail 50% of the time and P2 can fail 40% of the time, what is the failure rate of program P**	
	a	50%
	b	60%
	c	70%
	d	10%
70	**Which of the following strategy is employed for overcoming the priority inversion problem?**	
	a	Temporarily raise the priority of lower priority level process
	b	Have a fixed priority level scheme
	c	Implement kernel pre-emption scheme
	d	Allow lower priority process to complete its job
71	**Let P(E) denote the probability of the occurrence of event E. If P(A) = 0.5 and P(B) = 1, then the values of P(A/B) and P(B/A) respectively are**	
	a	0.5, 0.25
	b	0.25, 0.5
	c	0.5, 1
	d	1, 0.5
72	**How many diagonals can be drawn by joining the angular points of an octagon?**	
	a	14
	b	20
	c	21
	d	28
73	**What are the final states of the DFA generated from the following NFA?** 	
	a	q_0, q_1, q_2
	b	$[q_0, q_1], [q_0, q_2], [\,]$
	c	$q_0, [q_1, q_2]$
	d	$[q_0, q_1], q_2$

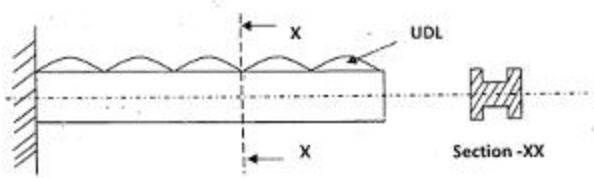
74	The number of elements in the power set of the set {{A,B},C} is	
	a	7
	b	8
	c	3
	d	4
75	What is the right way to declare a copy constructor of a class if the name of the class is MyClass?	
	a	MyClass (constant MyClass *arg)
	b	MyClass (constant MyClass &arg)
	c	MyClass (MyClass arg)
	d	MyClass (MyClass *arg)
76	The number of edges in a 'n' vertex complete graph is ?	
	a	n * (n-1) / 2
	b	n^2
	c	n * (n+1) / 2
	d	n * (n+1)
77	The binary equivalent of the decimal number 42.75 is	
	a	101010.110
	b	100110.101
	c	101010.101
	d	100110.110
78	Which of the following is not provided as a service in cloud computing?	
	a	Infrastructure as a service
	b	Architecture as a service
	c	Software as a service
	d	Platform as a service
79	The built-in base class in Java, which is used to handle all exceptions is	
	a	Raise
	b	Exception
	c	Error
	d	Throwable
80	In graphics, the number of vanishing points depends on	
	a	the number of axes cut by the projection plane
	b	the centre of projection
	c	the number of axes which are parallel to the projection plane
	d	the perspective projections of any set of parallel lines that are not parallel to the projection plane

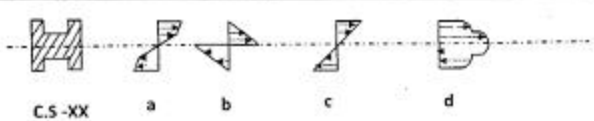
1 A concentrated load P is applied at the end of a cantilever as shown in Fig. The cross section of the beam is a square of side 'a' with a hole of dia 'a/2'. The deflection at the tip of the cantilever is given by



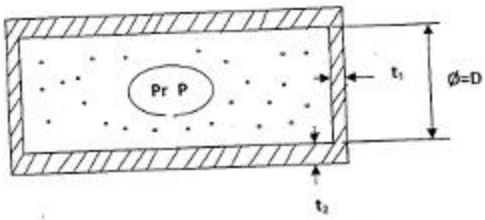
(a)	(b)	(c)	(d)
$\frac{3P}{E}\frac{L^3}{a^4}$	$\frac{1024\,P}{(256-3\pi)E}\frac{L^3}{a^4}$	$\frac{1024P}{(256-\frac{\pi}{64})E}\frac{L^3}{a^4}$	$\frac{256\,P}{(1024-3\pi)E}\frac{L^3}{a^4}$

2 A cantilever beam is subjected to a UDL. The cross section of the beam is a H-Section placed as shown in Fig. The bending stress distribution across the cross section will be



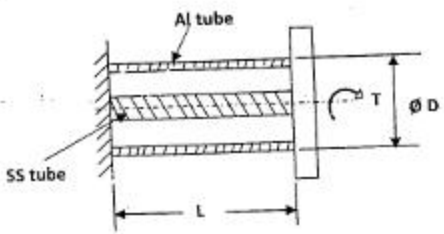


3 A thick cylinder of inner dia 'D', wall thickness t_2 and length 'L' is sealed at its both ends with caps. The thickness of the cap is t_1. Allowable tensile yield stress = σ_y and allowable shear stress = τ_y. A gas is pumped into this cylinder at pressure 'p'. The cap will yield in shear at circumference of diameter 'D' when the gas pressure applied is more than



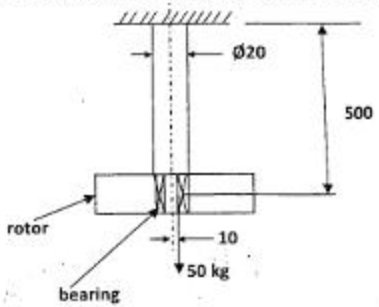
(a)	(b)	(c)	(d)
$\frac{4t_1\tau_y}{D}$	$\frac{8t_1\tau_y}{D}$	$\frac{4t_2\sigma_y}{D}$	$\frac{2t_1\tau_y}{D}$

4 An 'SS' tube is inserted into an 'Al' tube. They are permanently fixed at one end. The other end is attached to a rigid plate. A torque 'T' is applied to the rigid plate. The circumference of the 'Al' tube at dia 'D' at the plate end with respect to the fixed end rotates by a distance .....mm due to torque 'T'. The polar MOI & Rigidity modulus of Al & SS are J_{Al}, G_{Al} and J_{SS}, G_{SS} respectively.



(a)	(b)	(c)	(d)
$\frac{DLT}{2(G_{Al}J_{Al} - G_{SS}J_{SS})}$	$\frac{DLT}{2G_{Al}J_{Al}}$	$\frac{DLT}{2(G_{Al}J_{Al} + G_{SS}J_{SS})}$	$\frac{2\,DLT}{G_{SS}J_{SS}}$

5 A rod of 20 dia is fixed to the ceiling of a roof on one end. A rotor of 50 kg mass is attached to the free end with bearings. The CG of the rotor is 10 mm away from the shaft axis. The rotor is rotating at 600 rpm. The max tensile stress (in N/ Sq.mm) in the rod is nearly equal to



(a) $\pi/2$	(b) 200π	(c) 300π	(d) 400π

6 An automotive engine having a mass of 135 kg is supported on 4 springs with linear characteristics. Each of the 2 front springs have stiffness of 3 MN/m while the stiffness of each of 2 rear springs is 4.5 MN/m. The engine speed (rpm) at which resonance is likely to occur is

(a) $10^3/(6\pi)$	(b) $1/(6\pi)$	(c) $10^4/(\pi)$	(d) $10^5/(3)$

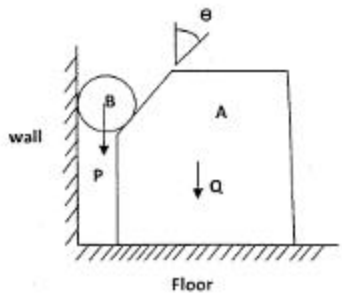
7 A weighing m/c consists of a 2 kg pan resting on a spring having linear characteristics. In this condition of resting on the spring, the length of spring is 200mm. When a 20 kg mass is placed on the pan, the length of the spring becomes 100mm. The undeformed length L in mm and the spring stiffness K in N/m are

a) L = 220 & K=1862	(b) L = 200, K = 1960
(c) L = 210, K = 1960	(d) L = 200, K = 2

8 A circular shaft is subjected to a torque 'T' and a Bending Moment M. The ratio of max. shear stress to max. bending stress is

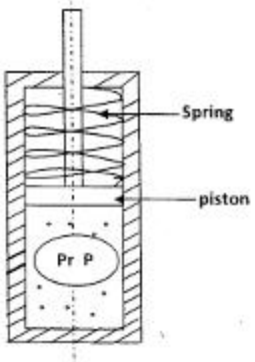
(a) 2M/T	(b) T/2M	(c) 2T/M	(d) M/2T

9 A solid block 'A' weighing 'Q' kg is resting on a flat floor. A smooth cylinder 'B' weighing 'P' kg. is placed between the solid A and the vertical wall as shown in fig. The friction between the cylinder, wall and the block A is negligible. The co-efficient of friction between the block A and floor is μ. The minimum weight P required to disturb the block A is



(a)	(b)	(c)	(d)
$\frac{Q\,(1-Tan\,\theta)}{\mu\ Tan\theta}$	$\frac{\mu Q\ Tan\theta}{(1-\mu\ Tan\ \theta)}$	$\mu\ Q\ Cos\theta$	$\frac{\mu\ Q}{Cos\theta}$

10 A hydraulic jack is used to compress a spring as shown in fig. Stiffness of spring is 10^5 N/m. By applying a pressure 'p' in the hydraulic cylinder, the spring gets compressed by 10mm. The cross sectional area of the piston is 25 cm^2. The applied pressure 'p is



	(a) 4 x 10^5 Pascals	(b) 40 Pascals	(c) 250 Pascals	(d) 25 Pascals
11	A small plastic boat loaded with pieces of steel rods is floating in a bath tub. If the cargo is dumped into the water , allowing the boat to float empty, the water level in the tub will			
	(a) Rise	(b) Fall	(c) Remains the same	(d) Rise and then fall
12	Viscosity of water in comparison to mercury is			
	(a) higher	(b) lower	(c) same	(d) unpredictable
13	Froude number is significant in:			
	(a) Supersonics, as with projectile and jet propulsion			
	(b) Full immersion or completely enclosed flow, as with pipes, air crafts wings, nozzles, etc.			
	(c) Simultaneous motion through two fluids where there is a surface discontinuity, gravity forces and wave making effect, as with ship's hulls			
	(d) All of these			
14	The purpose of surge tank in a pipe line is to			
	(a) smoothen the flow of water		(b) minimize friction losses in pipe	
	(c) prevent occurrence of hydraulic jump		(d) relieve pressure due to water hammer	
15.	Head loss in turbulent flow in a pipe			
	(a) varies directly as velocity		(b) varies inversely as square of velocity	
	(c) varies approximately as square of velocity		(d) varies inversely as velocity	
16.	A tank 1.5m stands on a trolly and is full of water. It has an orifice of diameter 0.1m at 0.3m from the bottom of the tank. If the orifice is suddenly opened and coefficient of discharge of the orifice is 0.60, then the propelling force on the trolley will be			
	(a) 69.37 N	(b) 67.39 N	(c) 63.79 N	(d) 65.39 N
17.	A model of a hydraulic turbine is tested at a head of $1/4^{th}$ of that under which the full scale turbine works. The diameter of the model is half of that of the full scale turbine. If N is the RPM of the full scale turbine, then RPM of the model will be			
	(a) N/4	(b) N/2	(c) N	(d) 2N
18	Consider steady, incompressible and irrotational flow through a reducer in a horizontal pipe, where the diameter is reduced from 20 cm to 10 cm. The pressure in the 20 cm pipe just upstream of the reducer is 150 kPa . The fluid has a vapour pressure of 50 kPa and a specific weight of 5 kN/m^3 . Neglecting frictional effects, the maximum discharge (in m^3 /sec) that can pass through the reducer without causing cavitations is			

	(a) 0.05	(b) 0.16	(c) 0.27	(d) 0.38
19	For the stability of a floating body, under the influence of gravity alone, which of the following is true?			
	(a) Metacentre should be below the centre of gravity			
	(b) Metacentre should be above the centre of gravity			
	(c) Metacentre and centre of gravity must lie on the same horizontal line			
	(d) Metacentre and centre of gravity must lie on the same vertical line			
20	A smooth pipe of diameter 200mm carries water. The pressure in the pipe at Section S1 (elevation: 10m) is 50 kPa . At section S2 (elevation: 12 m) the pressure is 20 kPa and velocity is 2 m/sec . Density of water is 1000 kg/ m^3 and acceleration due to gravity is 9.8 m/ sec^2 . Which of the following is true?			
	(a) Flow is from S1 to S2 and head loss is 0.53m	(b) Flow is from S2 to S1, and head loss is 0.53m		
	(c) Flow is from S1 to S2 and head loss is 1.06m	(d) Flow is from S2 to S1 and head loss is 1.06m		
21.	The 2-D flow with velocity $\vec{v} = (x + 2y + 2)\,i + (4 - y)\,j$ is			
	(a) compressible and irrotational	(b) compressible and not irrotational		
	(c) incompressible and irrotational	(d) incompressible and not irrotational		
22.	A venturimeter of 20mm throat diameter is used to measure the velocity of water in a horizontal pipe of 40mm diameter. If the pressure difference between the pipe and throat sections is found to be 30 kPa, then, neglecting frictional losses, the flow velocity is			
	(a) 0.2 m/sec	(b) 1.0 m/sec	(c) 1.4 m/sec	(d) 2.0 m/sec
23	A room contains 60 kg of air at 100 kPa and 15°C. The room has a 250-W refrigerator (the refrigerator consumes 250 W of electricity when running), a 120-W TV, a 1-kW electric resistance heater, and a 50-W fan. During a cold winter day, it is observed that the refrigerator, the TV, the fan, and the electric resistance heater are running continuously but the air temperature in the room remains constant. The rate of heat loss from the room that day is			
	(a) 3312 kJ/h	(b) 4752 kJ/h	(c) 5112 kJ/h	(d) 2952 kJ/h
24.	Efficiency of Carnot engine is given as 80 %. If the cycle direction is reversed, what will be the value of COP of reversed Carnot cycle			
	(a) 1.25	(b) 0.5	(c) 0.25	(d) none of the above

25. An adiabatic heat exchanger is used to heat cold water at 15°C entering at a rate of 5 kg/s by hot air at 90°C entering also at rate of 5 kg/s. If the exit temperature of hot air is 20°C, the exit temperature of cold water is

(a) 27°C (b) 32°C (c) 52°C (d) 85°C

26. For given combined radiative and convective heat transfer coefficient 'h_t' and given thermal conductivity k, Critical thickness of insulation for cylinder and sphere is given as

(a) $\frac{k}{h_t}$ and $\frac{k}{h_t^2}$ (b) $\frac{k}{h_t}$ and $\frac{2k}{h_t}$ (c) $\frac{2k}{h_t}$ and $\frac{k}{h_t^2}$ (d) $\frac{2k}{h_t}$ and $\frac{k}{h_t}$

27. Match the following

P:Compressible flow	U: Reynolds number
Q: Free surface flow	V: Nusselt number
R: Boundary layer flow	W: Weber number
S: Pipe flow	X: Froude number
T: Heat convection	Y: Mach number
	Z: Skin friction coefficient

(a) P-U; Q-X; R-V; S-Z; T-W (b) P-W; Q-X; R-Z; S-U; T-V
(c) P-Y; Q-W; R-Z; S-U; T-X (d) P-Y; Q-W; R-Z; S-U; T-V

28. A spherical thermocouple junction of diameter 0.706 mm is to be used for the measurement of temperature of a gas stream. The convective heat transfer co-efficient on the bead surface is 400 W/m^{2}K. Thermo-physical properties of thermocouple material are k = 20 W/mK, C = 400 J/kg K and r = 8500 kg/m^3. If the thermocouple initially at 30°C is placed in a hot stream of 300°C, the time taken by the bead to reach 298°C, is

a) 2.35 s b) 4.9 s c) 14.7 s d) 29.4 s

29. Two insulating materials of thermal conductivity K and 2K are available for lagging a pipe carrying a hot fluid. If the radial thickness of each material is the same.

(a) material with higher thermal conductivity should be used for the inner layer and one with lower thermal conductivity for the outer.
(b) material with lower thermal conductivity should be used for the inner layer and one with higher thermal conductivity for the outer.
(c) it is immaterial in which sequence the insulating materials are used
(d) it is not possible to judge unless numerical values of dimensions are given.

30. The definition of 1 K as per the internationally accepted temperature scale is

(a) 1/100th the difference between normal boiling point and normal freezing point of water.

(b) 1/273.15th the normal freezing point of water

(c) 100 times the difference between the triple point of water and the normal freezing point of water.

(d) 1/273.16th of the triple point of water.

31. For a perfect gas match list I with list II:

List I	List II
(A) Isobaric thermal expansion coefficient	(1) 0
(B) Isothermal compressibility	(2) ∞
(C) Isentropic compressibility	(3) 1/v
(D) Joule – Thomson coefficient	(4) 1/T
	(5) 1/p
	(6) $1/\gamma p$

(a) A-4,B-3,C-2, D-1 (b) A-1,B-2,C-4, D-6 (c) A-4,B-5,C-6, D-1 (d) A-3,B-4,C-6, D-5

32. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for

(a) copper (b) steel (c) glass-wool (d) refractory brick

33. Select statements from List II matching the processes in List I. Enter your answer as A, B if the correct choice for (1) is (A) and that for (2) is (B)

List I	List II
(A) Fourier number	(1) Surface tension
(B) Weber number	(2) Forced convection
(C) Grashoff number	(3) Natural convection
(D) Schmidt number	(4) Radiation
	(5) Transient heat conduction
	(6) Mass diffusion

(a) A-2, B-1, C-3, D-5 (b) A-5, B-1, C-3, D-6 (c) A-5, B-2, C-3, D-1 (d) A-5, B-1, C-3, D-4

34 In a radiative heat transfer, a gray surface is one

(a) which appears gray to the eye (b) whose emissivity is independent of wavelength

(c) which has reflectivity equal to zero (d) which appears equally bright from all directions

35.	A system undergoes a state change from 1 to 2. According the second law of thermodynamics for the process to be feasible, the entropy change, S2 – S1 of the system			
	(a) is positive or zero	(b) is negative or zero		
	(c) is zero	(d) can be positive, negative or zero		
36.	In descending order of magnitude, the thermal conductivity of (a) pure iron, (b) liquid water, (c) saturated water vapour and (d) aluminum can be arranged as			
	(a) a b c d	(b) b c a d	(c) d a b c	(d) d c b a
37.	For the same inlet and outlet temperatures of hot and cold fluids, the Log Mean Temperature Difference (LMTD) is			
	(a) greater for parallel flow heat exchanger than for counter flow heat exchanger.			
	(b) greater for counter flow heat exchanger than for parallel flow heat exchanger.			
	(c) same for both parallel and counter flow heat exchangers.			
	(d) dependent on the properties of the fluids.			
38.	A positive value of Joule-Thomson coefficient of a fluid means			
	(a) temperature drops during throttling	(b) temperature remains constant during throttling		
	(c) temperature rises during throttling	(d) none of these		
39.	A Carnot engine rejects 30% of absorbed heat to a sink at 30°C. The temperature of the heat source is			
	(a) 100 °C	(b) 433 °C	(c) 737 °C	(d) 1010 °C
40.	An engine operates between temperature limits of 900 K and T and T and 400 K. For both to be equally efficient, the values of T will be			
	(a) 700 K	(b) 600 K	(c) 750 K	(d) 650 K
41	In a heat exchanger, the hot liquid enters with a temperature of 180°C and leaves at 160°C. The cooling fluid enters at 30°C and leaves at 110°C. The capacity ratio of the heat exchanger is			
	(a) 0.25	(b) 0.40	(c) 0.50	(d) 0.55