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Preface

B. Singh (Ex. IES)

When in fifteenth century, some audacious mariners had sailed to discover America; in the eyes of their contemporaries it wasn't justifiable but the fervour to uncover America from rest of the world made them to set the voyage. As it is rightly said "Heritage of man is not the earth but the entire universe"; and now man dares to assault the sky, just because of thinking what was never thought.

ISRO is such a organisation which think creatively and think beyond imagination. Ranging from 31 satellites in one flight to FATBOY to now 104 satellites in one rocket, launching and establishing satellites has become ISRO's metier.

To be a part of such great organisation is matter of pride hence, to help all aspirants looking forward to be the part of INDIA's next space exploration, MADE EASY team has solved accurately and in detail all previous years' papers of DRDO and ISRO.

MADE EASY team has made deep study of previous exam papers and observed that a good percentage of questions are repetitive. This book containing fully explained questions from 2007 onwards will serve as an effective tool to succeed in examination.

I would like to acknowledge efforts of entire MADE EASY team who worked hard to solve previous years' papers with accuracy and I hope this book will stand upto the expectations of aspirants and my desire to serve student fraternity by providing best study material and quality guidance will get accomplished.

With Best Wishes

B. Singh

CMD, MADE EASY Group

ISRO : CS

Previous Years Solved Papers

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ISRO

Indian Space Research Organization

(Technical)

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1 ISRO-2007

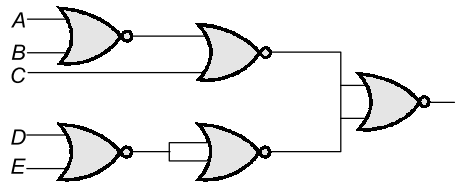
(Indian Space Research Organisation)

Q.1 The boolean expression $Y = (A + \bar{B} + \bar{A}B)\bar{C}$ is given by

(a) $A\bar{C}$ (b) $B\bar{C}$

(c) $\bar{C}$ (d) AB

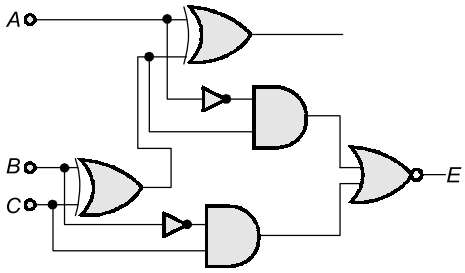
Q.2 The circuit shown in the following figure realizes the function.



(a) $(\overline{A+B}+C)(\bar{D}\bar{E})$ (b) $(\overline{A+B}+C)(D\bar{E})$

(c) $(A+\overline{B+C})(\bar{D}E)$ (d) $(A+B+\bar{C})(\bar{D}\bar{E})$

Q.3 The circuit shown in the given figure is a



(a) full adder (b) full subtracter

(c) shift register (d) decade counter

Q.4 When two numbers are added in excess-3 code and the sum is less than 9, then in order to get the correct answer it is necessary to

(a) subtract 0011 from the sum

(b) add 0011 to the sum

(c) subtract 0110 from the sum

(d) add 0110 to the sum

Q.5 The characteristic equation of an SR flip-flop is given by

(a) $Q_{n+1} = S + RQ_n$ (b) $Q_{n+1} = S\bar{Q}_n + \bar{S}Q_n$

(c) $Q_{n+1} = \bar{S} + RQ_n$ (d) $Q_{n+1} = S + \bar{R}Q_n$

Q.6 A graph with n vertices and $n - 1$ edges that is not a tree, is

(a) Connected (b) Disconnected

(c) Euler (d) A circuit

Q.7 If a graph requires k different colours for its proper colouring, then the chromatic number of the graph is

(a) 1 (b) k

(c) $k - 1$ (d) $\frac{k}{2}$

Q.8 A read bit can be read

(a) and written by CPU

(b) and written by peripheral

(c) by peripheral and written by CPU

(d) by CPU and written by the peripheral

Q.9 Eigen Vectors of $\begin{bmatrix} 1 & \cos\theta \\ \cos\theta & 1 \end{bmatrix}$

(a) $\begin{bmatrix} a^n & 1 \\ 0 & a^n \end{bmatrix}$ (b) $\begin{bmatrix} a^n & n \\ 0 & a^n \end{bmatrix}$

(c) $\begin{bmatrix} a^n & na^{n-1} \\ 0 & a^n \end{bmatrix}$ (d) $\begin{bmatrix} a^n & na^{n-1} \\ -n & a^n \end{bmatrix}$

Q.10 The term 'aging' refers to

(a) booting up the priority of the process in multi-level of queue without feedback.

(b) gradually increasing the priority of jobs that wait in the system for a long time to remedy infinite blocking

(c) keeping track of the following a page has been in memory for the purpose of LRU replacement

(d) letting job reside in memory for a certain amount of time so that the number of pages required can be estimated accurately.

Q.11 Consider a set of n tasks with known run times r_1, r_2, ... r_n to be run on a uniprocessor machine. Which of the following processor scheduling algorithms will result in the maximum throughput?

(a) Round Robin
(b) Shortest job first
(c) Highest response ratio next
(d) First come first served

Q.12 Consider a job scheduling problem with 4 jobs J_1, J_2, J_3 and J_4 with corresponding deadlines: $(d_1, d_2, d_3, d_4) = (4, 2, 4, 2)$. Which of the following is not a feasible schedule without violating any job schedule?
(a) J_2, J_4, J_1, J_3 (b) J_4, J_1, J_2, J_3
(c) J_4, J_2, J_1, J_3 (d) J_4, J_2, J_3, J_1

Q.13 By using an eight bit optical encoder the degree of resolution that can be obtained is (approximately)
(a) 1.8° (b) 3.4°
(c) 2.8° (d) 1.4°

Q.14 The principal of the locality of reference justifies the use of
(a) virtual memory (b) interrupts
(c) main memory (d) cache memory

Q.15 Consider the following pseudo-code
x ; = 1;
i ; = 1;
while (x <= 1000) begin
x : = 2^x;
i; = i + 1; end;
What is the value of i at the end of the pseudo-code?
(a) 4 (b) 5
(c) 6 (d) 7

Q.16 The five items: *A*, *B*, *C*, *D*, and *E* are pushed in a stack, one after other starting from *A*. The stack is popped four items and each element is inserted in a queue. The two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is
(a) *A* (b) *B*
(c) *C* (d) *D*

Q.17 Round Robin schedule is essentially the preemptive version of
(a) FIFO
(b) Shortest job first
(c) Shortest remaining time
(d) Longest remaining time

Q.18 The number of digit 1 present in the binary representation of $3 \times 512 + 7 \times 64 + 5 \times 8 + 3$ is
(a) 8 (b) 9
(c) 10 (d) 12

Q.19 Assume that each character code consists of 8 bits. The number of characters that can be transmitted per second through an synchronous serial line at 2400 baud rate, and with two stop bits is
(a) 109 (b) 216
(c) 218 (d) 219

Q.20 If the bandwidth of a signal is 5 kHz and the lowest frequency is 52 kHz, what is the highest frequency
(a) 5 kHz (b) 10 kHz
(c) 47 kHz (d) 57 kHZ

Q.21 An Ethernet hub
(a) functions as a repeater
(b) connects to a digital PBX
(c) connects to a token-ring network
(d) functions as a gateway

Q.22 Phase transition for each bit are used in
(a) Amplitude modulation
(b) Carrier modulation
(c) Manchester encoding
(d) NRZ encoding

Q.23 Study the following program
// precondition : x >= 0
public void demo (int x)
{ System. out.print (x % 10)
if ((x / 10) ! = 10)
{
demo (x / 10);
}
System. out.print (x % 10)
}
Which of the following is printed as a result of the call demo (1234)?
(a) 1441 (b) 3443
(c) 12344321 (d) 43211234

Q.24 Bit stuffing refers to
(a) inserting a 0 in user stream to differentiate it with a flag
(b) Inserting a 0 in flag stream to avoid ambiguity
(c) appending a nipple to the flag sequence
(d) appending a nipple to the use data stream

Q.25 What is the name of the technique in which the operating system of a computer executes several programs concurrently by switching back and forth between them?
(a) Partitioning (b) Multi-tasking
(c) Windowing (d) Paging

Q.26 If there are five routers and six networks in intranet using link state routing, how many routing tables are there?
(a) 1 (b) 5
(c) 6 (d) 11

Q.27 Virtual memory is
(a) Part of Main Memory only used for swapping
(b) A technique to allow a program, of size more than the size of main memory, to run
(c) Part of secondary storage used in program execution
(d) None of these

Q.28 The level of aggregation of information required for operational control is
(a) Detailed (b) Aggregate
(c) Qualitative (d) None of these

Q.29 The set of all Equivalence Classes of a set A of Cardinality C
(a) is of cardinality 2^c
(b) have the same cardinality as A
(c) forms a partition of A
(d) is of cardinality c^2

Q.30 0.75 decimal system is equivalent to _____ in octal system
(a) 0.60 (b) 0.52
(c) 0.54 (d) 0.50

Q.31 In an SR latch made by cross-coupling two NAND gates, if both S and R inputs are set to 0, then it will result in
(a) $Q = 0, Q' = 1$ (b) $Q = 1, Q' = 0$
(c) $Q = 1, Q' = 1$ (d) Indeterminate states

Q.32 Identify the correct translation into logical notation of the following assertion. Some boys in the class are taller than all the girls

Note: taller (x, y) is true if x is taller then y.

(a) $(\exists x)(\text{boy}(x) \rightarrow (\forall y)(\text{girl}(y) \text{ and taller}(x, y)))$

(b) $(\exists x)(\text{boy}(x) \text{ and } (\forall y)(\text{girl}(y) \text{ and taller}(x, y)))$

(c) $(\exists x)(\text{boy}(x) \rightarrow (\forall \text{y})(\text{girl}(\text{y}) \rightarrow \text{taller}(x, \text{y})))$

(d) $(\exists x)(\text{boy}(x) \text{ and } (\forall y)(\text{girl}(y) \rightarrow \text{taller}(x, y)))$

Q.33 Company X shipped 5 computer chips, 1 of which was defective, and company Y shipped 4 computer chips, 2 of which were defective. One computer chip is to be chosen uniformly at a random from the 9 chips shipped by the companies. If the chosen chip is found to be defective, what is the probability that the chip came from the company Y?
(a) $\frac{2}{9}$ (b) $\frac{4}{9}$
(c) $\frac{2}{3}$ (d) $\frac{1}{2}$

Q.34 Ring counter is analogous to
(a) Toogle Switch
(b) Latch
(c) Stepping Switch
(d) S-R flip-flop

Q.35 The output 0 and 1 level for TTL logic family is approximately
(a) 0.1 and 5 V (b) 0.6 and 3.5 V
(c) 0.9 and 1.75 V (d) –1.75 and 0.9 V

Q.36 Consider a computer system that stores a floating-point numbers with 16-bit mantissa and an 8-bit exponent, each in two's complement. The smallest and largest positive values which can be stored are
(a) 1×10^{-128} and $2^{15} \times 10^{128}$
(b) 1×10^{-256} and $2^{15} \times 10^{255}$
(c) 1×10^{-128} and $2^{15} \times 10^{127}$
(d) 1×10^{-128} and $(2^{15} - 1) \times 10^{127}$

Q.37 In comparison with static RAM memory, the dynamic RAM memory has
(a) lower bit density and higher power consumption
(b) higher bit density and higher power consumption
(c) lower bit density and lower power consumption
(d) higher bit density and lower power consumption

Q.38 The Hexadecimal equivalent of 0 1 1 1 1 1 0 0 1 1 0 1 1 1 1 0 0 0 1 1 is
(a) CD73E (b) ABD3F
(c) 7CDE3 (d) FA4CD

Answers ISRO-2007

1.	(c)	2.	(a)	3.	(b)	4.	(a)	5.	(d)	6.	(b)	7.	(b)	8.	(d)
9.	(*)	10.	(b)	11.	(b)	12.	(b)	13.	(d)	14.	(d)	15.	(b)	16.	(d)
17.	(a)	18.	(b)	19.	(c)	20.	(d)	21.	(a)	22.	(c)	23.	(d)	24.	(a)
25.	(b)	26.	(b)	27.	(b)	28.	(a)	29.	(c)	30.	(a)	31.	(d)	32.	(d)
33.	(c)	34.	(c)	35.	(b)	36.	(d)	37.	(b)	38.	(c)	39.	(b)	40.	(a)
41.	(d)	42.	(b)	43.	(b)	44.	(a)	45.	(c)	46.	(c)	47.	(b)	48.	(a)
49.	(c)	50.	(b)	51.	(d)	52.	(a)	53.	(a)	54.	(b)	55.	(a)	56.	(a)
57.	(a)	58.	(d)	59.	(a)	60.	(a)	61.	(*)	62.	(a)	63.	(d)	64.	(b)
65.	(c)	66.	(c)	67.	(d)	68.	(d)	69.	(c)	70.	(d)	71.	(b)	72.	(b)
73.	(c)	74.	(d)	75.	(b)	76.	(d)	77.	(b)	78.	(c)	79.	(d)	80.	(c)

Note: ** None of the given option is correct. Question may contain insufficient data.*

Explanations ISRO-2007

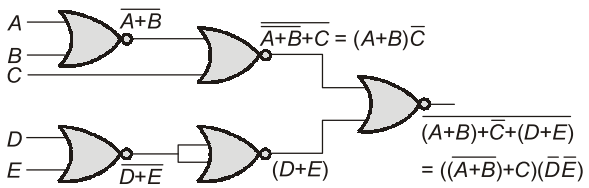
1. (c)

$$\begin{aligned} Y &= (A+\bar{B}+\bar{A}B)\bar{C} \\ &= A\bar{C}+\bar{B}\bar{C}+\bar{A}B\bar{C} \\ &= \bar{C}(A+\bar{A}B)+\bar{B}\bar{C}\{X+YZ\} \\ &= (X+Y)(X+Z)\} \\ &= \bar{C}((A+\bar{A})(A+B))+\bar{B}\bar{C} \\ &= \bar{C}(A+B)+\bar{B}\bar{C} \end{aligned}$$

$\{x+\bar{x}=1, x\cdot 1=x\}$

$$\begin{aligned} &= A\bar{C}+B\bar{C}+\bar{B}\bar{C} \\ &= A\bar{C}+\bar{C}(B+\bar{B}) \\ &= \bar{C}(1+A)=\bar{C} \end{aligned}$$

2. (a)



3. (b)

The circuit shown in the question is of a full subtractor which is constructed by the help of two half subtractors.

4. (a)

When two numbers are added in excess-3 code and the sum is less than 9, then in order to get the correct answer, we need to subtract 0011 i.e., $(3)_{10}$ from the sum.

5. (d)

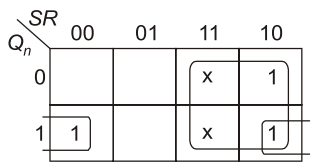
Characteristic equation of SR flip-flop is,

$$Q_{n+1} = S+\bar{R}Q_n$$

The characteristic table for SR flip-flop is:

Q_n	S	R	Q_{n+1}
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	x
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	x

Drawing the R map:



The characteristic equation will be

$$Q_{n+1} = S+\bar{R}Q_n$$

6. (b)

If the number of vertices are 'n' and there are '$n-1$' edges and is not a tree. Considering the graph to be a simple graph, it can be said that the graph is disconnected.

7. (b)

Since to properly colour a graph, 'k' different colours are needed. Hence, the chromatic number of the graph is 'k'.

8. (d)

A read bit can be read by CPU and written by the peripheral.

10. (b)

Priority scheduling algorithm suffers from the problem of starvation. There might be the case that some low priority process does not get CPU, because of high priority processes. A solution to this problem is **Aging:** Aging refers to gradually increasing the priority of jobs that wait in the system for a long time to remedy infinite blocking.

11. (b)

Throughput refers to total number of tasks executed per unit time. Shortest job first scheduling algorithm will result in the maximum throughput because all the shortest jobs will be executed first hence many task will be completed.

12. (b)

Since the deadline of Jobs 'J_2' and 'J_4' is less as compared to the other two jobs, hence these two jobs must be executed first. So, completing J_1 after J_4 is will not be a feasible schedule of the four jobs.

13. (d)

By using an 8-bit optical encoder, the degree of resolution that can be obtained is

$$\frac{360}{2^8} = 1.4 \text{ degree}$$

14. (d)

Locality of reference is a term which is used where the related storage locations are frequently accessed. A cache is used in which the content of the memory locations that are related to the memory location currently accessed in moved to the cache will the possibility that it will be accessed.

15. (b)

On execution of the program, initially 'i' = 1, 'x' = 1; while condition is true, so now $x = 2$, $i = 2$, again condition satisfies, so now, $x = 4$, $i = 3$, again condition is satisfied, $x = 16$, $i = 4$; condition is satisfied so $x = 2^{16}$, $i = 5$. This time the condition will be false. So, the value of i will be 5 at the end.

16. (d)

Four items are pushed into stack A, B, C, D, E where Top is pointing E. Now 4 elements are deleted and enqueue into queue. So queue contain E, D, C, B where Rear is pointing B and Front pointing E.

Now two elements are deleted from the queue i.e. E and D respectively and pushed back on the stack i.e., e, d where stack Top pointing D now delete one element from stack gives D.

17. (a)

In round robin scheduling algorithm, the processes run for a fixed time quantum in the same schedule in which they have arrived and are then preempted after the time quantum expires. Later, they are inserted in the job queue and again get CPU for the fixed time quantum is required.

So, it can be said that it's the preemptive version of FIFO.

18. (b)

$3 \times 512 + 7 \times 64 + 5 \times 8 + 3$

$\Rightarrow (2+1)2^9 + (2^2 + 2 + 1)2^6 + (2^2 + 1)\,2^3 + (2 + 1)$

$\Rightarrow 2^{10} + 2^9 + 2^8 + 2^7 + 2^6 + 2^5 + 2^3 + 2^1 + 2^0$

$\Rightarrow$ 11111101011

Therefore, total number of 1's are 9.

19. (c)

Baud rate = 2400

Total number of bits = 8 + 1 start bit + 2 stop bits

= 11 bits

Number of characters transmitted / sec

$$= \frac{2400}{11} = 218.18 \approx 218$$

Hence, 218 characters can be transmitted per second.

2 ISRO-2008

(Indian Space Research Organisation)

Q.1 Which of the following is an illegal array definition?
(a) Type COLONGE : (LIME, PINE, MUSK, MENTHOL); var a : array [COLONGE] or REAL;
(b) var *a* : array [REAL] of REAL;
(c) var *a* : array ['A' ... 'Z'] of REAL;
(d) var *a* : array [BOOLEAN] of REAL;

Q.2 The term Phong associated with
(a) Ray tracing
(b) Shading
(c) Hidden line removal
(d) a game

Q.3 The subnet mask 255.255.255.192
(a) extends the network portion to 16 bits
(b) extends the network portion to 26 bits
(c) extends the network portion to 36 bits
(d) has no effect on the network portion of an IP address

Q.4 On a LAN, where are IP datagrams transported?
(a) In the LAN header
(b) In the application field
(c) In the information field of the LAN frame
(d) After the TCP header

Q.5 In Ethernet, the source address field in the MAC frame is the _____ address.
(a) original sender's physical
(b) previous station's physical
(c) next destination's physical
(d) original sender's service port

Q.6 Which of the following transmission media is not readily suitable to CSMA operation?
(a) Radio (b) Optical fibers
(c) Coaxial cable (d) Twisted pair

Q.7 Consider the grammar:

$S \rightarrow ABCc \mid bc$
$BA \rightarrow AB$
$Bb \rightarrow bb$
$Ab \rightarrow ab$
$Aa \rightarrow aa$

Which of the following sentences can be derived by this grammar?
(a) *abc* (b) *aab*
(c) *abcc* (d) *abbc*

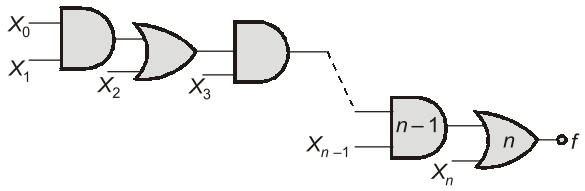
Q.8 The TCP sliding window
(a) can be used to control the flow of information
(b) always occurs when the field value is 0
(c) always occurs when the field value is 1
(d) occurs horizontally

Q.9 What is the bandwidth of the signal that ranges from 40 kHz 4 MHz
(a) 36 MHz (b) 360 kHz
(c) 3.96 MHz (d) 396 MHz

Q.10 Which Project 802 standard provides for a collision-free protocol?
(a) 802.2 (b) 802.3
(c) 802.5 (d) 802.6

Q.11 The Boolean theorem $AB + \bar{A}C + BC = AB + \bar{A}C$ corresponds to
(a) $(A+B)\cdot(\bar{A}+C)\cdot(B+C) = (A+B)\cdot(\bar{A}+C)$
(b) $AB + \bar{A}C + BC = AB + BC$
(c) $AB + \bar{A}C + BC = (A+B)\cdot(\bar{A}+C)\cdot(B+C)$
(d) $(A+B)\cdot(\bar{A}+C)\cdot(B+C) = AB + \bar{A}C$

Q.12 In the given network of AND and OR gates *f* can be written as



(a) $X_0 X_1 X_2 \ldots X_n + X_1 X_2 \ldots X_n + X_2 X_3 \ldots X_n + \ldots + X_n$
(b) $X_0 X_1 + X_2 X_3 + \ldots + X_{n-1} X_n$
(c) $X_0 + X_1 + X_2 + \ldots + X_n$
(d) $X_0 X_1 + X_3 \ldots X_{n-1} + X_2 X_3 + X_5 \ldots X_{n-1} + \ldots + X_{n-2} X_{n-1} + X_n$

Q.13 If $N^2 = (7601)_8$ where N is a positive integer, then the value of N is
(a) $(241)_5$ (b) $(143)_6$
(c) $(165)_7$ (d) $(39)_{16}$

Q.14 Assume that each character code consists of 8 bits. The number of characters that can be transmitted per second through an synchronous serial line at 2400 baud rate, and with two stop bits, is :
(a) 109 (b) 216
(c) 218 (d) 219

Q.15 Four jobs to be executed on a single processor system arrive at time 0 in the order *A*, *B*, *C*, *D*. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of *A* under round robin scheduling with time slice of one time unit is
(a) 10 (b) 4
(c) 8 (d) 9

Q.16 Which one of the following algorithm design techniques is used in finding all pairs of shortest distances in a graph?
(a) Dynamic programming
(b) Backtracking
(c) Greedy
(d) Divide and Conquer

Q.17 The address space of 8086 CPU is
(a) 1 Megabyte
(b) 256 Kilobytes
(c) 1 K Megabytes
(d) 64 Kilobytes

Q.18 More than one word are put in one cache block to
(a) exploit the temporal locality of reference in a program
(b) exploit the spatial locality of reference in a program
(c) reduce the miss penalty
(d) None of these

Q.19 The performance of a pipelined processor suffers if
(a) the pipeline stages have different delays
(b) consecutive instructions are dependent on each other
(c) the pipeline stages share hardware resources
(d) All of the above

Q.20 If $(12x)_3 = (123)_x$, then the value of x is
(a) 3 (b) 3 or 4
(c) 2 (d) None of these

Q.21 The advantage of MOS devices over bipolar devices is that
(a) it allows higher bit densities and also cost effective
(b) it is easy to fabricate
(c) it is higher-impedance and operational speed
(d) all of these

Q.22 How many 2-input multiplexers are required to construct a 2^{10}-input multiplexer?
(a) 1023 (b) 31
(c) 10 (d) 127

Q.23 A computer uses 8 digit mantissa and 2 digit exponent. If $a = 0.052$ and $b = 28\ E + 11$ then $b + a - b$ will
(a) result in an overflow error
(b) result in an underflow error
(c) be 0
(d) be 5.28E + 11

Q.24 The Boolean expression $(A + \bar{C})(\bar{B} + \bar{C})$ simplifies to
(a) $\bar{C} + A\bar{B}$ (b) $\bar{C}(\bar{A} + B)$
(c) $\bar{B}\bar{C} + A\bar{B}$ (d) None of these

Q.25 In the expression $\bar{A}(\bar{A} + \bar{B})$ by writing the first term A as $A + 0$, the expression is best simplified as
(a) $A + AB$ (b) AB
(c) A (d) $A + B$

Q.26 The logic operation of two combinational circuits in Figure-I and Figure-II are

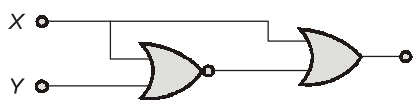


Figure-I

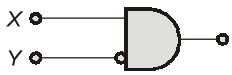


Figure-II

(a) entirely different
(b) identical
(c) complementary
(d) dual

Answers ISRO-2008

1.	(b)	2.	(b)	3.	(b)	4.	(c)	5.	(b)	6.	(a)	7.	(*)	8.	(a)
9.	(c)	10.	(c)	11.	(a)	12.	(*)	13.	(b)	14.	(c)	15.	(d)	16.	(a)
17.	(a)	18.	(b)	19.	(d)	20.	(d)	21.	(d)	22.	(a)	23.	(c)	24.	(a)
25.	(*)	26.	(a)	27.	(b)	28.	(b)	29.	(c)	30.	(b)	31.	(a)	32.	(c)
33.	(a)	34.	(c)	35.	(a)	36.	(a)	37.	(d)	38.	(b)	39.	(c)	40.	(c)
41.	(c)	42.	(c)	43.	(b)	44.	(b)	45.	(d)	46.	(d)	47.	(b)	48.	(b)
49.	(c)	50.	(b)	51.	(a)	52.	(c)	53.	(d)	54.	(c)	55.	(c)	56.	(a)
57.	(a)	58.	(b)	59.	(c)	60.	(d)	61.	(c)	62.	(b)	63.	(d)	64.	(b)
65.	(a)	66.	(d)	67.	(c)	68.	(a)	69.	(a)	70.	(c)	71.	(b)	72.	(a)
73.	(c)	74.	(a)	75.	(d)	76.	(c)	77.	(b)	78.	(d)	79.	(a)	80.	(c)

Note: ** None of the given option is correct. Question may contain insufficient data.*

Explanations ISRO-2008

1. (b)

Array index must be integers. Enumerators, characters and boolean can be used in place of an integer but not real.

2. (b)

The term 'Phong' is associated with shading. Phong shading refers to an interpolation technique for surface shading in 3D computer graphics. It is also known as Phong interpolation or normal-vector interpolation shading.

3. (b)

The subnet mask 255.255.255.192 has total 26 bits. Default subnet mask for class 'C' is 255.255.255.0/24. 192 is written as 11000000 which has 2 subnet id bits and rest are host id bits.

4. (c)

On a LAN, the IP datagrams are transported in the information field of ethernet frame.

5. (b)

In ethernet, the source address field in the MAC frame is the previous stations physical address. Source and destination's physical address changes multiple time throughout the route may times, whereas the logical address i.e., the IP address never change throughout the path from the original search to the final receiver.

6. (a)

Radio is not suitable to CSMA operation. The collision may remain undetected if CSMA operation is used.

8. (a)

TCP sliding window can be used to control the flow of information. A sliding window is a feature of packet-based data transmission protocols, by placing limits on the number of packets that can be transmitted or received at any given time, a sliding window protocol allows an unlimited number of packets to be communicated using fixed-size sequence numbers.

9. (c)

Highest frequency = 4 MHz

Lowest frequency = 40 kHz

Bandwidth = Highest freq. – Lowest freq.

= 4 MHz – 0.04 MHz

= 3.96 MHz

10. (c)

In IEEE 802.5, the token passing scheme is used. Token ring local area network technology is a communication protocol for LAN. The token passing is a channel access method providing fair access for all stations, and eliminating the collision of contention-based access methods.

11. (a)

Boolean theorem:

$$AB + \bar{A}C + BC = AB + \bar{A}C$$

Computing the dual of the boolean theorem in which '·' is replaced by '+' and '+' is replaced by '·', we get

$$(A + B)(\bar{A} + C)(B + C) = (A + B)(\bar{A} + C)$$

13. (b)

$$N^2 = (7601)_8$$
$$\Rightarrow N^2 = 7 \times 8^3 + 6 \times 8^2 + 0 \times 8^1 + 1 \times 8^0$$
$$\Rightarrow N^2 = 3969$$
$$\Rightarrow N = 63$$

Considering option (b) i.e., $(143)_6$, it can be written as

$$= 1 \times 6^2 + 4 \times 6^1 + 3 \times 6^0$$
$$= 36 + 24 + 3 = 63$$

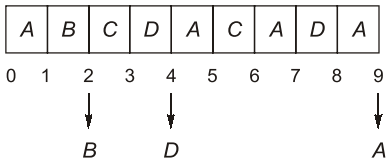
14. (c)

Since baud rate is 2400, hence a maximum of 2400 bits are transferred per second. Total data is of 11 bits, since there are 8 bits of character code, 1 start bit and 2 stop bits.

Hence, number of characters transmitted per second $= \frac{2400}{11} = \lfloor 218.18 \rfloor = 218.$

15. (d)

Process will execute in the following manner,



Hence, the completion times of process '*A*' is 9 time units using round robin scheduling with time slice of 1 time unit.

16. (a)

All pair shortest distance in a graph is calculated using Floyd Warshal's algorithm which works on dynamic programming approach.

17. (a)

In 8086 microprocessor, data times are of 16 bit and address lines are of 20 bit which constitutes the address space of 2^{20} bytes i.e., 1 MB.

18. (b)

More than one word are put in one cache block to exploit the spatial locality of reference in a program. Spatial locality refers to the use of data element with in relatively close storage locations.

19. (d)

If the pipeline stages have different delay, then the maximum of all the delays is taken for every stage. If consecutive instruction are dependent on each other or if the pipeline stages share hardware resources, it will create stalls.

Hence all the condition will lead to an impact on the performance of pipelined processor.

20. (d)

If the radix of a number is 'x' the any number of that radix can contain digits from 0 to $x - 1$. So, as per the question the radix of LHS is 3 so there can only be digits from 0 to 2. Since, 2 is in the option, hence considering 2 as the radix of RHS will make 123 invalid, since only 0 and 1 digits will be allowed.

22. (a)

At the first, there will be 512 MUX, at second level, there will be 256 MUX, at third level 128 MUX will be there continuous so till 1 MUX is required.

Total required = 512 + 256 + 128 + 64 + 64 + 32 +16 + 8 + 4 + 2 + 1 = 1023

23. (c)

Since '*a*' is 0.052, hence Mantissa will be '0.52' and exponent will be '–1'.

Since '*b*' is '28E +11', hence Mantissa will be '0.28' and exponent will be '13'.

'$b + a$' will be 280000000000000. 52E–1 ≈ 28 E+11.

So, now '$b - b$' will be 0.

3 ISRO-2009

(Indian Space Research Organisation)

Q.1 The subnet mask for a particular network is 255. 255.31.0. Which of the following pairs of IP addresses could belong to this network?
(a) 172.57.88.62 and 172.56.87.23
(b) 10.35.28.2 and 10.35.29.4
(c) 191.203.31.87 and 191.234. 31.88
(d) 128.8.129.43 and 128.8.161.55

Q.2 In networking, UTP stands for
(a) Unshielded T-connector port
(b) Unshielded twisted pair
(c) Unshielded terminating pair
(d) Unshielded transmission process

Q.3 The address resolution protocol (ARP) is used for
(a) Finding the IP address from the DNS
(b) Finding the IP address of the default gateway
(c) Finding the IP address that corresponds to a MAC address
(d) Finding the MAC address that corresponds to an IP address

Q.4 Which of the following is a MAC address?
(a) 192.166.200.50
(b) 00056A : 01A01A5CCA7FF60
(c) 568, Airport Road
(d) 01 : A5 : BB : A7 : FF : 60

Q.5 What is the primary purpose of a VLAN?
(a) Demonstrating the proper layout for a network
(b) Simulating a network
(c) To create a virtual private network
(d) Segmenting a network inside a switch or device

Q.6 SHA-1 is a
(a) encryption algorithm
(b) decryption algorithm
(c) key exchange algorithm
(d) message digest function

Q.7 Advanced Encryption Standard (AES) is based on
(a) Asymmetric key algorithm
(b) Symmetric key algorithm
(c) Public key algorithm
(d) Key exchange

Q.8 The primary purpose of an operating system is
(a) To make most efficient use of the computer hardware
(b) To allow people to use the computer
(c) To keep systems programmers employed
(d) To make computers easier to use

Q.9 Which is the correct definition of a valid process transition in an operating system?
(a) Wake up : ready → running
(b) Dispatch : ready → running
(c) Block : ready → running
(d) Timer runout : → ready → running

Q.10 The correct matching of the following pairs is

List-I	List-II
A. Disk check	1. Round robin
B. Batch processing	2. Scan
C. Time sharing	3. LIFO
D. Stack operation	4. FIFO

Codes:

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

Q.11 A page fault
(a) Occurs when a program accesses an available page on memory
(b) is an error in a specific page
(c) is a reference to a page belonging to another program
(d) occurs when a program accesses a page not currently in memory

Q.12 Using a larger block size in a fixed block size file system leads to

(a) better disk throughput but poorer disk space utilization
(b) better disk throughput and better disk space utilization
(c) poorer disk throughput but better disk space utilization
(d) poorer disk throughput and poorer disk space utilization

Q.13 Which of the following statements about synchronous and asynchronous I/O is NOT true?
(a) An ISR is invoked on completion of I/O in synchronous I/O but not in asynchronous I/O
(b) In both synchronous and asynchronous I/O, an ISR (Interrupt Service Routine) is invoked after completion of the I/O
(c) A process making a synchronous I/O call waits until I/O is complete, but a process making an asynchronous I/O call does not wait for completion of the I/O
(d) In the case of synchronous I/O, the process waiting for the completion of I/O is woken up by the ISR that is invoked after the completion of I/O

Q.14 Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.
(a) 1 (b) 2
(c) 3 (d) 4

Q.15 The performance of Round Robin algorithm depends heavily on
(a) size of the process
(b) the I/O bursts of the process
(c) the CPU bursts of the process
(d) the size of the time quantum

Q.16 Consider a system having "n" resources of same type. These resources are shared by 3 processes, A, B, C. These have peak demands of 3, 4, and 6 respectively. For what value of "n" deadlock won't occur
(a) 15 (b) 9
(c) 10 (d) 13

Q.17 Consider a set of 5 processes whose arrival time, CPU time needed and the priority are given below:

Process	Arrival Time (in ms)	CPU Time needed	Priority
P_1	0	10	5
P_2	0	5	2
P_3	2	3	1
P_4	5	20	4
P_5	10	2	3

(Smaller the number, higher the priority). If the CPU scheduling policy is priority scheduling without preemption, the average waiting time will be
(a) 12.8 ms (b) 11.8 ms
(c) 10.8 ms (d) 09.8 ms

Q.18 The range of integers that can be represented by an n-bit 2's complement number system is
(a) -2^{n-1} to $(2^{n-1} - 1)$
(b) $-(2^{n-1} - 1)$ to $(2^{n-1} - 1)$
(c) -2^{n-1} to 2^{n-1}
(d) $-(2^{n-1} + 1)$ to $(2^{n-1} - 1)$

Q.19 The switching expression corresponding to $f(A, B, C, D) = \sum(1, 4, 5, 9, 11, 12)$ is
(a) $BC'D' + A'C'D + AB'D$
(b) $ABC' + ACD + B'C'D$
(c) $ACD' + A'BC' + AC'D'$
(d) $A'BD + ACD' + BCD'$

Q.20 Consider the following boolean function of four variables $f(w, x, y, z) = \sum(1, 3, 4, 6, 9, 11, 12, 14)$, the function is
(a) Independent of one variable
(b) Independent of two variables
(c) Independent of three variables
(d) Dependent on all variables

Q.21 In which addressing mode, the effective address of the operand is generated by adding a constant value to the content of a register?
(a) Absolute mode
(b) Indirect mode
(c) Immediate mode
(d) Index mode

Q.22 A certain microprocessor requires 4.5 microseconds to respond to an interrupt. Assuming that the three interrupts I_1, I_2 and I_3 require the following execution time after the interrupt is recognized :

1. I_1 requires 25 microseconds
2. I_2 requires 35 microseconds
3. I_3 requires 20 microseconds

I_1 has the highest priority and I_3 has the lowest. What is the possible range of time for I_3 to be executed assuming that it may or may not occur simultaneously with other interrupts?

(a) 24.5 microseconds to 39.5 microseconds
(b) 24.5 microseconds to 93.5 microseconds
(c) 4.5 microseconds to 24.5 microseconds
(d) 29.5 microseconds 93.5 microseconds

Q.23 The process of organizing the memory into two banks to allow 8 and 16 bit data operation is called

(a) Bank switching
(b) Indexed mapping
(c) Two-way memory interleaving
(d) Memory segmentation

Q.24 Suppose the numbers 7, 5, 1, 8, 3, 6, 0, 9, 4, 2 are inserted in that order into an initially empty binary search tree. The binary search tree uses the usual ordering on natural numbers. What is the in-order traversal sequence of the resultant tree?

(a) 7 5 1 0 3 2 4 6 8 9
(b) 0 2 4 3 1 6 5 9 8 7
(c) 0 1 2 3 4 5 6 7 8 9
(d) 9 8 6 4 2 3 0 1 5 7

Q.25 A data structure is required for storing a set of integers such that each of the following operations can be done in (log n) time, where n is the number of elements in the set.

1. Deletion of the smallest element
2. Insertion of an element if it is not already present in the set

Which of the following data structures can be used for this purpose?

(a) A heap can be used but not a balanced binary search tree
(b) A balanced binary search tree can be used but not a heap
(c) Both balanced binary search tree and heap can be used
(d) Neither balanced search tree nor heap can be used

Q.26 The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?

(a) 2 (b) 3
(c) 4 (d) 6

Q.27 Assume that the operators +, –, × are left associative and ^ is right associative. The order of precedence (from highest to lowest) is ^, ×, +, –. The postfix expression corresponding to the infix expression $a + b \times c - d \wedge e \wedge f$ is

(a) $abc \times + def \wedge\wedge -$
(b) $abc \times + de \wedge f \wedge$
(c) $ab + c \times d - e \wedge f \wedge$
(d) $- + a \times bc \wedge\wedge def -$

Q.28 The infix expression $A + (B - C)*D$ is correctly represented in prefix notation as

(a) $A + B - C*D$ (b) $+A* - BCD$
(c) $ABC - D*+$ (d) $A + BC - D*$

Q.29 A one dimensional array A has indices 1 ... 75. Each element is a string and takes up three memory words. The array is stored location 1120 decimal. The starting address of $A[49]$ is

(a) 1267 (b) 1164
(c) 1264 (d) 1169

Q.30 The five items: A, B, C, D, and E are pushed in a stack, one after other starting from A. The stack is popped four items and each element is inserted in a queue. The two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is

(a) A (b) B
(c) C (d) D

Q.31 A full binary tree with n leaves contains

(a) n nodes (b) $\log_2 n$ nodes
(c) $2n - 1$ (d) 2^n nodes

Q.32 The expression 1 * 2 ^ 3 * 4 ^ * 6 will be evaluated as

(a) 32^{30} (b) 162^{30}
(c) 49152 (d) 173458

Q.33 The feature in object-oriented programming that allows the same operation to be carried out differently, depending on the object, is

(a) Inheritance (b) Polymorphism
(c) Over functioning (d) Overriding