TEST SERIES UGC-NET/JRF Jan. 2017

BOOKLET SERIES A

Paper Code 87

Test Type: TEST SERIES

COMPUTER SCIENCE & APPLICATIONS

Duration: 02:00 Hours

Date: 16-12-2016

Maximum Marks: 120

Read the following instructions carefully:

1 Attempt all the questions.

2. This booklet contain 60 Objective Type Questions, each Question carry **2 marks** each.

3. There will be no negative marking.

4. Darken the appropriate bubbles with HB pencil/Ball Pen to write your answer.

5. The candidates shall be allowed to carry the Question Paper Booklet after completion of the exam.

CAREER ENDEAVOUR
Best Institute for IIT-JAM, NET & GATE

South Delhi Centre: 28-A/11, Jia Sarai, Near-IIT Hauz Khas, New Delhi-16
T : 011-26851008, 26861009

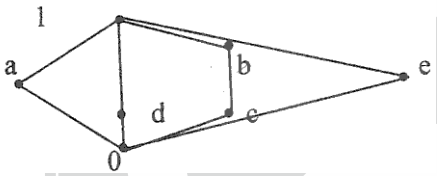
North Delhi Centre: 33-35, Mall Road, G.T.B. Nagar (Opp. Metro Gate No.3), Delhi-09
T : 011-65462244, 65662255
E : info@careerendeavour.com, W : www.careerendeavour.com

1. The negation of "every complete bipartite graph is not planar" in predicate calculus is
C(x) : x is a complete graph B(x) : x is bipartite
(a) $\sim \forall x(C(x) \wedge B(x)) \rightarrow P(x)$ (b) $\exists x(C(x) \wedge B(x) \wedge P(x))$
(c) $\exists x(C(x) \wedge B(x) \wedge P(x))$ (d) none

2. Which of the following are valid
(i) $\forall x \exists y P(x, y) \Rightarrow \exists y \forall x P(x, y)$ (ii) $\exists x \forall y P(x, y) \Rightarrow \forall y \exists x P(x, y)$
(iii) $\forall x \forall y P(x, y) \Rightarrow \exists x \exists y P(x, y)$ (iv) $\forall x \exists y P(x, y) \Rightarrow \exists x \exists y P(x, y)$
(a) (ii), (iii), (iv) (b) (i), (iii), (iv) (c) (i), (ii), (iii) (d) (i), (ii), (iv)

3. Which of the folloiwng statements are tautologies
$S_1 = \sim (p \vee q) \vee (p \wedge q) \vee p$
$S_2 = [[p \wedge \sim q] \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$
(a) S_1 is a tautology and S_2 is not a tautology (b) S_2 is a tautology and S_1 is not a tautology
(c) Both S_1 and S_2 are tautology (d) Neither S_1 nor S_2 is a tautology

4. The number of complements of the element 'a' in the lattice shown below is



(a) 1 (b) 2 (c) 3 (d) 4

5. Let S = {0, 1, 2, 3, 4, 5, 6, 7} and * denote multiplication modulo 8 that is x*y = (xy) mod 8. Which of the following is a group w.r.t*?
(a) {0, 1} (b) {1, 4} (c) {1, 3} (d) {1,6}

6. Let S= {a, b} and let P(S) is power set of S. Consider the relation '$\subseteq$' (set inclusion) on P(S). Which of the folloiwng is false?
(a) P(S) is a join semi lattice (b) P (S) is a meet semi lattice
(c) P (S) is a lattice (d) P (S) is a totally ordered set

7. The solution of the recurrence relation $a_n = 2\, a_{n-1} + n$ where $a_0 = 1$ is
(a) $a_n = 3(2^n) - n - 2$ (b) $a_n = 2\,(2^n) - n - 2$
(c) $a_n = 3(2^n) + n + 2$ (d) $a_n = 2^{(n-1)} + n - 2$

8. A simple graph with 10 vertices must be connected if it has more than
(a) 36 edge (b) 9 edges (c) 10 edges (d) 30 edges

9. Consider the statements
S_1 : The complement of a spanning tree does not contain a cut set.
S_2 : The complement of a cut set does not contain a spannning tree.
Which of the following is true?
(a) S_1 is True and S_2 is False (b) S_1 is False and S_2 is True
(c) Both S_1 and S_2 is True (d) Both S_1 and S_2 are False

10. If $n(A) = 20$, $n(B) = 16$, $n(C) = 8$, $n(A \cup B \cup C) = 31$, $n(A \cap B \cap \overline{C}) = 3$, $n(A \cap \overline{B} \cap C) = 4$ $n(\overline{A} \cap B \cap C) = 2$, then $n(A \cap B \cap C) = ?$
(a) 1 (b) 2 (c) 3 (d) 4

11. Let $A = \{x \in R \mid x \neq 2\}$ and $B = \{x \in R \mid x \neq 1\}$
Defined $f: A \to B$ and $g: B \to A$ by
$f(x) = x/(x-2)$, $g(x) = 2x/(x-1)$ then,
which of he following is false?
(a) fog = gof (b) $fog = l_B$ (c) $f = g^{-1}$ (d) fog is a bijection

12. A shelf contain 5 separate compartments. In how many ways 8 similar books be placed in the compartments so that no compartment is empty?
(a) 40 (b) 35 (c) 56 (d) 336

13. Which one is not a size measure for software product?
(a) LOC (b) Halstead's program length
(c) Function Count (d) Cyclomatic Complexity

14. Which of the property of software modularity is incorrect with respect to benefits software modularity?
(a) Modules are robust.
(b) Module can use other modules
(c) Modules Can be separately compiled and stored in a library.
(d) Modules are mostly dependent.

15. Which is the most important feature of spiral model?
(a) Quality management (b) Risk management
(c) Performance management (d) Efficiency management

16. Match the List 1 to List 2 and choose the correct option.

1. Requirement Elicitation	(A) Module Development and integration.
2. Design	(B) Analysis
3. Implementation	(C) Structure and behavioral
4. Maintenance	(D) Performance tuning.

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

17. Match the following **List-1** with **List-2**:

(A) Good quality	(i) Program does not fail for a specified time in a given environment
(B) Correctness	(ii) Meets the functional requirements
(C) Predictable	(iii) Meets both functional and non-functional requirements
(D) Reliable	(iv) Process is under statistical control Codes

(a) A - (iii), B - (ii), C - (iv), D – (i) (b) A - (ii), B - (iii), C - (iv), D - (i)
(c) A- (i), B - (ii), C - (iv), D - (iii) (d) A - (i), D - (ii), C - (iii), D – (iv)

18. Consider a banking application which requires 26,700 LOC. If the productivity of a person in 870 loc per month, consider the salary of the developer is $5000 per month, find the cost of the application?
(a)157000 (b)153500 (c)178000 (d) none

19. Consider a digital image processing application which contains 3 modules
M_1 = 14.4 KLOC
M_2 = 21.5 KLOC
M_3 = 8.4 KLOC
If the productivity of the developer is 4KLOC per month, find the effort required in person-month(pm)?
(a)13.3 (b)16.8 (c)11.1 (d)22.2

20. Consider a DRDO application in the development, company predicts the size of the entire application as follows:
4600 KLOC optimistic
6900 KLOC most likely
8600 KLOC pessimistic

First calculate the predicated size using which find the productivity if the software development effort is 8 person month?
(a) 850 (b) 690 (c) 470 (d) 549

21. Compilers, Editors software come under which type of software?
(a) System software (b) Application software
(c) Scientific software (d) None of the above.

22. Assume that the size of an organic type software product has been estimated to be 32,000 lines of source code. Assume that the average salary of software engineers be Rs. 15,000/- per month. Determine the effort required to develop the software product and the nominal development and cost time using basic ?(use a_b=2.4, b_b=1.05,c_b=2.5,d_b=.38) cocomo.
(a) E=91 TIME= 15
(b) E=78 TIME= 11
(c) E=91 TIME= 14
(d) E=118 TIME= 19

23. Assume that the size of an software product has been estimated to be 45,000 lines of source code. Assume that the average salary of software engineers be Rs. 45,000/- per month. Determine the effort required to develop the software product and the nominal development timeand cost, if productivity of the developer is 2000 lines of code per month and the team contains 4 persons.
(a) E=11.87 TIME= 6.550
(b) E=22.5 TIME= 6.525
(c) E=19.5 TIME= 4.750
(d) E=22.5 TIME= 5.625

24. Assume that the size of an system software product has been estimated to be 40,000 lines of source code. Determine the effort required to develop the software product and the nominal development time using cocomo?(use a_b=1.4, b_b=1.2,c_b=2.6,d_b=.4)
(a) E=117.11 TIME= 17.45
(b) E=121.45 TIME= 16.525
(c) E=19.5 TIME= 4.750
(d) none

25. Three concurrent processes X, Y, and Z execute three different code segments that access and update certain shared variables. Process X executes the P operation (i.e., wait) on semaphores A, B and C; process Y executes the P operation on semaphores B, C and D; process Z executes the P operation on semaphores C, D, and A before entering the respective code segments. After completing the execution of its code segment, each process invokes the V operation (i.e., signal) on its three semaphores. All semaphores are binary semaphores initialized to one. Which one of the following represents a deadlockfree order of invoking the P operations by the processes?
(a) X: P(A)P(B)P(C) Y:P(B)P(C)P(D) Z:P(C)P(D)P(A)
(b) X: P(B)P(A)P(C) Y:P(B)P(C)P(D) Z:P(A)P(C)P(D)
(c) X: P(B)P(A)P(C) Y:P(C)P(B)P(D) Z:P(A)P(C)P(D)
(d) X: P(A)P(B)P(C) Y:P(C)P(B)P(D) Z:P(C)P(D)P(A)

26. A system has n resources R_0,…,R_{n-1},and k processes P_0,….P_{k-1}.The implementation of the resource request logic of each process Pi is as follows:
if (i % 2 == 0) {
if (i < n) request R_i
if (i+2 < n) request R_{i+2}
}
else {
if (i < n) request R_{n-i}

if (i+2 < n) request R_{n-i-2}
}
In which one of the following situations is a deadlock possible?
(a) n=40, k=26 (b) n=21, k=12 (c) n=20, k=10 (d) n=41, k=19

27. Which of the following is NOT true of deadlock prevention and deadlock avoidance schemes?
(a) In deadlock prevention, the request for resources is always granted if the resulting state is safe
(b) In deadlock avoidance, the request for resources is always granted if the result state is safe
(c) Deadlock avoidance is less restrictive than deadlock prevention
(d) Deadlock avoidance requires knowledge of resource requirements a priori

28. An operating system uses the Banker's algorithm for deadlock avoidance when managing the allocation of three resource types X, Y, and Z to three processes P0, P1, and P2. The table given below presents the current system state. Here, the Allocation matrix shows the current number of resources of each type allocated to each process and the Max matrix shows the maximum number of resources of each type required by each process during its execution.

	Allocation			Max		
	X	Y	Z	X	Y	Z
P0	0	0	1	8	4	3
P1	3	2	0	6	2	0
P2	2	1	1	3	3	3

There are 3 units of type X, 2 units of type Y and 2 units of type Z still available. The system is currently in a safe state. Consider the following independent requests for additional resources in the current state:
REQ1: P0 requests 0 units of X,
0 units of Y and 2 units of Z
REQ2: P1 requests 2 units of X,
0 units of Y and 0 units of Z
Which one of the following is TRUE?
(a) Only REQ1 can be permitted.
(b) Only REQ2 can be permitted.
(c) Both REQ1 and REQ2 can be permitted.
(d) Neither REQ1 nor REQ2 can be permitted

29. Consider three processes (process id 0, 1, 2 respectively) with compute time bursts 2, 4 and 8 time units. All processes arrive at time zero. Consider the longest remaining time first (LRTF) scheduling algorithm. In LRTF ties are broken by giving priority to the process with the lowest process id. The average turn around time is:
(a) 13 units (b) 14 units (c) 15 units (d) 16 units

30. Consider the 3 processes, P1, P2 and P3 shown in the table.

Process	Arrival time	Time Units Required
P1	0	5
P2	1	7
P3	3	4

The completion order of the 3 processes under the policies FCFS and RR2 (round robin scheduling with CPU quantum of 2 time units) are
(a) FCFS: P1, P2, P3
RR2: P1, P2, P3
(b) FCFS: P1, P3, P2
RR2: P1, P3, P2
(c) FCFS: P1, P2, P3
RR2: P1, P3, P2
(d) FCFS: P1, P3, P2
RR2: P1, P2, P3

31. Consider a set of n tasks with known runtimes 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

32. Which of the following is major part of time taken when accessing data on the disk?
(a) Settle time (b) Rotational latency
(c) Seek time (d) Waiting time

33. We describe a protocol of input device communication below.
(1) Each device has a distinct address
(2) The bus controller scans each device in sequence of increasing address value to determine if the entity wishes to communicate.
(3) The device ready to communicate leaves it data in IO register.
(4) The data is picked up and the controller moves to step-a above.
Identify the form of communication best describes the IO mode amongst the following:
(a) Programmed mode of data transfer (b) DMA
(c) Interrupt mode (d) Polling

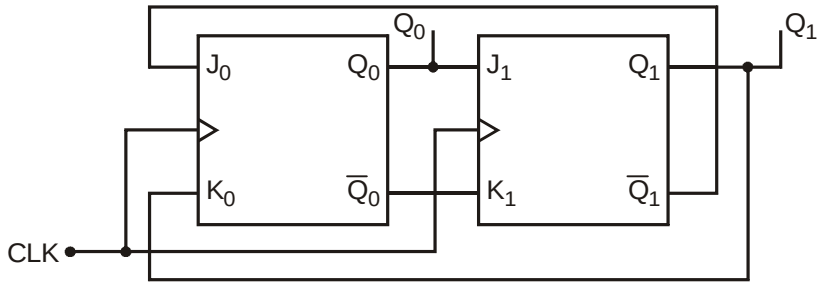
34. A file system with 300 G Byte disk uses a file descriptor with 8 direct block addresses, 1 indirect block address and 1 doubly indirect block address. The size of each disk block is 128 Bytes and the size of each disk block address is 8 Bytes. The maximum possible file size in this file system is
(a) 3 Kbytes (b) 35 Kbytes
(c) 280 Bytes (d) Dependent on the size of the disk

35. A system uses FIFO policy for page replacement. It has 4 page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then accesses the same 100 pages but now in the reverse order. How many page faults will occur?
(a) 196 (b) 192 (c) 197 (d) 195

36. Which of the following is NOT a valid deadlock prevention scheme?
(a) Release all resources before requesting a new resource
(b) Number the resources uniquely and never a lower numbered resource than the last one requested.
(c) Never request a resource after releasing any resource
(d) Request and all required resources be allocated before execution.

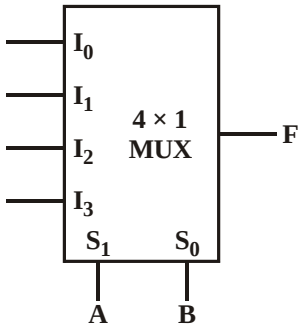
37. The Boolean expression $\overline{(\bar{a} + \bar{b} + c + \bar{d}) + (b + \bar{c})}$ simplifies to
(a) 1 (b) $\overline{a \cdot b}$ (c) $a \cdot b$ (d) 0

38. In the following sequential circuit, the initial state (before the first clock pulse) of the circuit is $Q_1Q_0 = 00$. The state (Q_1Q_0), immediately after the 333rd clock pulse is



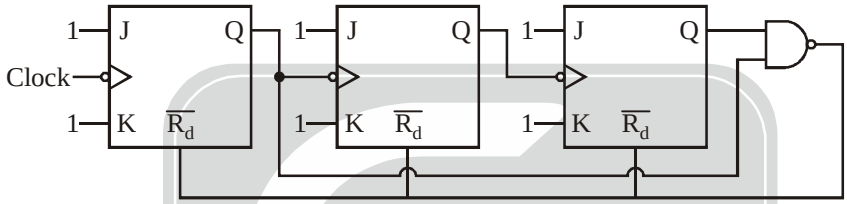
(a) 00 (b) 01 (c) 10 (d) 11

39. In the 4×1 multiplexer, the output F is given by $F = A \oplus B$. Find the required input '$I_3I_2I_1I_0$'.



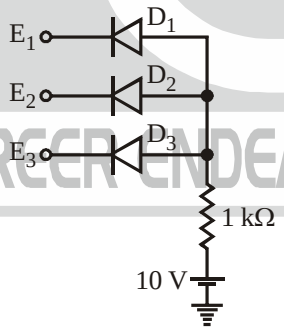
(a) 1010 (b) 0110 (c) 1000 (d) 1110

40. The circuit shown consists of J-K flip flops, each with an active low asynchronous reset ($\overline{R_d}$ input). The counter corresponding to this circuit is



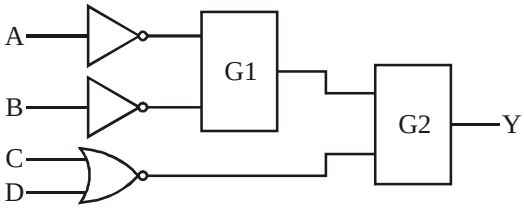
(a) a modulo-5 binary up counter (b) a modulo-6 binary down counter
(c) a modulo-5 binary down counter (d) a modulo-6 binary up counter

41. In the circuit shown, diodes D_1, D_2 and D_3 are ideal, and the inputs E_1, E_2 and E_3 are '0 V' for logic '0' and '10 V' for logic '1'. What logic gate does the circuit represent ?



(a) 3 input OR gate (b) 3 input NOR gate (c) 3 input AND gate (d) 3 input XOR gate

42. In the figure, the output Y is required to be $Y = AB + \overline{C}\overline{D}$. The gates G1 and G2 must be respectively,

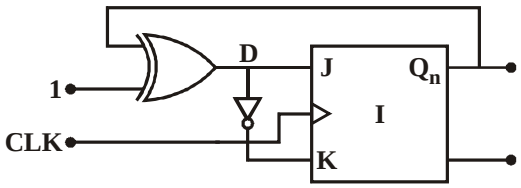


(a) NOR, OR (b) OR, NAND (c) NAND, OR (d) AND, NAND

43. The 8085 assembly language instruction that stores the content of L and H registers into the memory locations 2050 H and 2051 H, respectively, is

(a) SPHL 2050 H (b) SPHL 2051 H (c) SHLD 2050 H (d) STAX 2050 H

44. In the circuit shown in the given figure, if input I is set high, output Q_{n+1} becomes : Assume flip-flop is reset.



(a) $\bar{Q}_n$ (b) Q_n (c) High (d) Low

45. The following 8085 instructions are executed sequentially.

Label :	**Mnemonics**
PROG :	XRA A
	MOV L, A
	MOV H, L
	INX H
	DAD H

After execution, the content of HL register pair is :

(a) 0000 H (b) 0101 H (c) 0010 H (d) 0002 H

46. In the 8085 microprocessor, the RST 6 instruction transfers the program execution to the following location:

(a) 30 H (b) 24 H (c) 48 H (d) 60 H

47. Which one of the following is not a vectored interrupt ?

(a) TRAP (b) INTR (c) RST 7.5 (d) RST 3

48. Match **List-I** with **List-II** and select the correct answer using codes given below the lists :

List-I	**List-II**
A. TTL	1. Low propagation delay
B. ECL	2. Low power consumption
C. MOS	3. Higher packing density on Silicon wafer
D. CMOS	4. Saturated bipolar logic
	5. High Fan Out

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

49. If the size of the hash table = 32 and there are 31 elements in the hash table. What is the average number of comparision for successful search if double hashing is used for collision resolution?

(a) 15 (b) 11.61 (c) 32 (d) 31

50. Let G be a directed graph whose vertex set is the set of number from 1 to 508. There is an edge from a vertex i to a vertex j iff either j = i + 1 or j = 5i. The minimum number of edges in the path from vertex 2 to 508 is

(a) 9 (b) 10 (c) 11 (d) none of the above

51. A text contains the following character with their respective frequencies

character	a	b	c	d	e	f	g
frequency	37	18	29	13	30	17	6

How much memory is saved using variable length coding using huffmann coding

(a) 20% (b) 15% (c) 25% (d) 11%

52. Consider a weighted undirected graph with 4 vertices, where the weight of edge <i, j> is given by the entry W_{ij} in the matrix.

$$W = \begin{bmatrix} 0 & 2 & 8 & 5 \\ 2 & 0 & 5 & 8 \\ 8 & 5 & 0 & x \\ 5 & 8 & x & 0 \end{bmatrix}$$

The largest possible integer value of x, for which at least one shortest path between some pair of vertices will contain the edge with weight x is

(a) 12 (b) 3 (c) 2 (d) 11

53. Let G be a complete undirected graph on 4 vertices having 6 edgse with weights 1, 2, 3, 4, 5, 6. The maximum possible weight of minimum spanning tree of G can have is

(a) 6 (b) 7 (c) 8 (d) 9

54. Let Q and S represents a Queue and stack respectively. Consider the following code

```
while (Q! = ϕ)
{
        if (S is empty OR top (S) ≤ front (Q))
        {
                x = delete (Q);
                push (S, x);
        }
        else
        {
                x = pop (S);
                insert(Q, x);
        }
}
```

If the queue Q contains 25 elements initially and stack S is empty. What is the maximum possible number of iteratinos of While loop in the algorithm?

(a) 25 (b) 50 (c) 125 (d) 625

55. Let A, B, C and D are four matrices with orders 10×5, 5×20, 20×10 and 10×5 respectively. The minimum number of multiplications required to find the product ABCD is

(a) 1500 (b) 2000 (c) 500 (d) 1000

56. The number of ways in which the number 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 can be inserted into an empty binary search tree, such that resultant tree has height 9 is

(a) 64 (b) 132 (c) 254 (d) 102

57. Consider the following function.
What is the value of fun(4)?

```
int fun (int n)
{
        int x = 1, k;
        if (n = = 1) return x;
        for (k = 1; k < n; ++k)
                x = x + fun(k) *fun(n-k)
        return x;
}
```

(a) 51 (b) 15 (c) 21 (d) 25

58. In a permutation of $a_1, a_2, \ldots\ldots\ldots a_n$ of n distinct integer, an inversion is a pair (a_i, a_j) such that $i < j$ and $a[i] > a[j]$. What is the maximum number of inversions are possible in a permutation of 1, 2, 3, ……..n.

(a) $\frac{n(n-1)}{4}$ (b) $\frac{n(n-1)}{2}$ (c) $n(n-1)$ (d) $\frac{(n-1)}{4}$

59. BFS is started on a binary tree begining from the root vertex. There is a vertex 't' at a distance 4 from the root. If 't' is the nth vertex in this BFS traversal then the maximum possible value of n is

(a) 15 (b) 16 (c) 31 (d) 32

60. Match the following

Group-A	**Group-B**
(1) Dijkastra's Algo	(P) Dynamic programing
(2) Bellman ford algo	(Q) Greedy algo
(3) Floyd warshall algo	(R) Backtracking

	1	2	3
(a)	P	Q	R
(b)	P	R	Q
(c)	R	Q	P
(d)	R	P	Q

Space for rough work

COMPUTER SCIENCE & APPLICATIONS **Date : 16-12-2016**

TEST SERIES-(A)

ANSWER KEY

1. (b)	**2. (a)**	**3. (c)**	**4. (d)**	**5. (c)**	**6. (d)**	**7. (a)**
8. (a)	**9. (c)**	**10. (d)**	**11. (a)**	**12. (b)**	**13. (d)**	**14. (d)**
15. (b)	**16. (d)**	**17. (a)**	**18. (b)**	**19. (c)**	**20. (a)**	**21. (a)**
22. (c)	**23. (d)**	**24. (d)**	**25. (b)**	**26. (b)**	**27. (a)**	**28. (b)**
29. (a)	**30. (c)**	**31. (b)**	**32. (c)**	**33. (d)**	**34. (b)**	**35. (a)**
36. (c)	**37. (d)**	**38. (b)**	**39. (b)**	**40. (a)**	**41. (c)**	**42. (a)**
43. (c)	**44. (c)**	**45. (d)**	**46. (a)**	**47. (b)**	**48. (a)**	**49. (b)**
50. (a)	**51. (d)**	**52. (c)**	**53. (b)**	**54. (d)**	**55. (a)**	**56. (d)**
57. (b)	**58. (b)**	**59. (c)**	**60. (b)**			