

GATE -2012-13

Ci-Edutech Online Test Series

Subject Code: Computer Science and Engineering

Time: 3 Hours

General Guidelines

There are total of 65 questions carrying 100 marks.

Q.1 to Q.25 (25 questions) carry one mark each (**sub-total 25 marks**).

Q.26 to Q.55 (30 questions) carry two marks each (**sub-total 60 marks**).

Questions Q.56 - Q.65 belongs to General Aptitude (GA).

Questions Q.56 - Q.60 (5 questions) carry 1 mark each (**sub-total 5 marks**)

Q.61 - Q.65 (5 questions) carry 2-marks each (**sub-total 10 marks**).

Questions Q.48 - Q.51 (2 pairs) are common data questions.

Question pairs (Q.52, Q.53) and (Q.54, Q.55) are linked answer questions.

The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is un-attempted, then the answer to the second question in the pair will not be evaluated.

NEGATIVE MARKING:

For **Q.1 - Q.25** and **Q.56 - Q.60**, $\frac{1}{3}$ mark will be deducted for each wrong answer.

For **Q.26 - Q.51** and **Q.61 - Q.65**, $\frac{2}{3}$ mark will be deducted for each wrong answer.

The question pairs (**Q.52, Q.53**), and (**Q.54, Q.55**) are questions with linked answers. There will be negative marks only for wrong answer to the first question of the linked answer question pair i.e. for **Q.52** and **Q.54**, $\frac{2}{3}$ mark will be deducted for each wrong answer. There is no negative marking for **Q.53** and **Q.55**.

Questions on Engineering Mathematics will carry about 15% of the total marks (excluding General Aptitude section).

Questions 1 to 25 carry one mark only

1. A machine produces parts that are either good (90%), slightly defective (1%), or obviously defective (9%). Produced parts get passed through an automatic inspection machine, which is able to detect any part that is obviously defective and discard it. What is the quality of the parts that make it through the inspection machine and get shipped?

(A) 0.98 (B) 0.67 (C) 0.2 (D) 0.45

2. The $\lim_{x \rightarrow 0} \frac{\int_0^x \sin t^3 dt}{x^4}$ is

(A) 4 (B) 1/4 (C) 2 (D) 1/2

3. In a network, nodes are connected randomly. The probability of arrival of packets at a particular node follows Poisson distribution ($e^{-m} m^r / r!$). The average number of packets arrive at that node are

(A) m (B) m^2 (C) 2 (D) Cant be determined

4. The given matrix is

$$A = \begin{pmatrix} 1 & 0 & 1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{pmatrix}$$

(A) Unit Matrix (B) Orthogonal Matrix
(C) Derogatory (D) involuntary

5. The Function $f(x, y, z) = \Sigma m(0, 1, 3, 7)$ when implemented using gates suffers from

(A) Static Hazard (B) Dynamic Hazard (C) Static Hazard 1 (D) Static Hazard 0

6. In the bubble sort algorithm the maximum number of required comparisons for a list of 11 numbers are

(A) 44 (B) 55 (C) 66 (D) 77

7. The 2's complement of 158 is

- (A) 01100011 (B) 01110010 (C) 01101011 (D) 01100010

8. The inverse of the function $f(x) = |x|$ is given by

- (A) x (B) $|x|$ (C) $|x|/2$ (D) Can't be determined.

9. Relational Algebra does not have

- (A) Selection operator. (B) Projection operator.
(C) Aggregation operators. (D) Division operator.

10. The clause in SQL that specifies that the query result should be sorted in ascending or descending order based on the values of one or more columns is

- (A) View (B) Order by
(C) Group by (D) Having

11. A relation is in _____ if an attribute of a composite key is dependent on an attribute of other composite key.

- (A) 2NF (B) 3NF
(C) BCNF (D) 1NF

12. In an E-R diagram double lines indicate

- (A) Total participation. (B) Multiple participation.
(C) Cardinality N. (D) None of the above.

13. Block-interleaved distributed parity is RAID level

- (A) 2 (B) 3 (C) 4 (D) 5

14. Let $G = \{a, a^2, a^3, a^4 = 1\}$ and $H = \{1, a^2\}$ is a sub group of G. Find the coset of H in G.

- (A) $H, H+a$ (B) H, aH (C) $H, H+2a$ (D) $H, a^2 H$

15. Consider a cyclic group $\left[\{1, -1, i, -i\} \right]$. Find its generator

- (A) 1 (B) i (C) 2 (D) -1

16. If Let $A = \{1, 2\}$ and $B = \{1, 2, 3\}$, then the cardinality of $A \times B$ is

- (A) 4 (B) 5 (C) 6 (D) 7

17. Consider the relation $(x,y) \in R$ if $X \leq Y$, defined on the set of positive integers is

- (A) Reflective (B) antisymmetric, (C) antisymmetric and transitive, (D) a partial order

18. Find the inverse of a function $f(x) = y = 15x^2$. Determine if inverse is a function?

- (A) $f^{-1}(x) = \pm\sqrt{\frac{x}{15}}$ and $f^{-1}(x)$ is a function (B) $f^{-1}(x) = \pm\sqrt{\frac{x}{15}}$ and $f^{-1}(x)$ is not a function

- (C) $f^{-1}(x) = \sqrt{\frac{x}{15}}$ and $f^{-1}(x)$ is a function (D) $f^{-1}(x) = \sqrt{\frac{x}{15}}$ and $f^{-1}(x)$ is not a function

19. When $R \cap S = \phi$, then the cost of computing $R \bowtie S$ is

- (A) the same as $R \times S$ (B) greater than $R \times S$
(C) less than $R \times S$ (D) cannot say anything

20. Maximum height of a B+ tree of order m with n key values is

- (A) $\log_m(n)$ (B) $(m+n)/2$
(C) $\log_{m/2}(m+n)$ (D) None of these

21. The inverse of the permutation given below is

$$\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 4 & 2 \end{pmatrix}$$

- (A) $A^{-1} = (3 \ 1 \ 2 \ 4)$ (B) $A^{-1} = (2 \ 4 \ 3)$ (C) $A^{-1} = (2 \ 1 \ 3)$ (D) $A^{-1} = (4 \ 1 \ 3)$

22. The probability that A hits a target is $1/3$ and the probability that B hits the target is $2/5$. What is the probability that target will be hit if A and B each shoot at the target?

- (A) $3/5$ (B) $4/5$ (C) $2/5$ (D) $2/3$

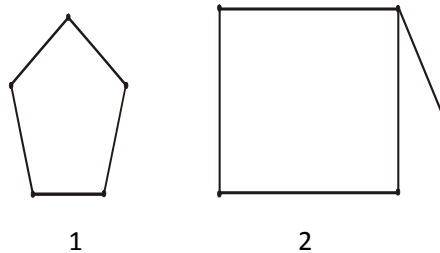
23. The logic $(p \wedge q) \vee (\sim p \vee (p \wedge \sim q))$ is

(A) is a tautology (B) is a contradiction (C) 3rd order logic (D) None

24. The cost of reading and writing temporary files while evaluating a query can be reduced by

- (A) building indices (B) pipelining
(C) join ordering (D) none of the above

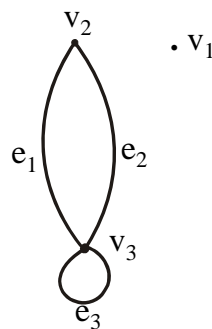
25. Two graphs are given below, find which of the following graph(s) is/ are bipartite



- (A) 1 only (B) 2 only (C) both (D) none

Question 26 to 47 carry two marks each

26. For the graph shown, the total degree of the Graph is



- (A) 2 (B) 4 (C) 6 (D) 8

27. Suppose an operating system is using Round Robin Scheduling with the ready (cpu) queue, where the time quantum is 8 milliseconds. Suppose the following sequence of events unfolds over time:

Process	Arrival Time (msecs)	Burst Time (msecs)
P0	0.0	12
P1	6.0	13
P2	12.0	9
P3	20.0	7

The average wait time for the four processes is

- (A) 13.75 (B) 15.75 (C) 17.5 (D) 10.25

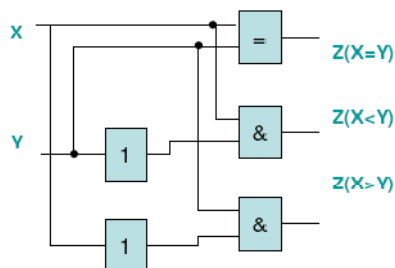
28. A combinational logic circuit is required which produces an output D from four input signals A, B, C_1 and C_2 according to following rules.

1. If C_1 and C_2 are both 1, the output D must be zero.
2. If C_1 and C_2 are both 0, the output D must be one.
3. If $C_1=1$ and $C_2 = 0$, the output D must be equal to A.
4. If $C_1=0$ and $C_2 = 1$, the output D must be equal to B.

Obtain the expression for D in the sum of product form

- (A) $\bar{A}\bar{C}_2 + B\bar{C}_1 + \bar{C}_1\bar{C}_2$ (B) $A\bar{C}_2 + B\bar{C}_1 + \bar{C}_1\bar{C}_2$
- (C) $A\bar{C}_2 + B\bar{C}_1 + \bar{C}_1\bar{C}_2$ (D) $A\bar{C}_2 + B\bar{C}_1 + \bar{C}_1C_2$

29. The circuit shown below acts as a



The circuit shown in the figure is

- (A) one bit magnitude comparator (B) two bit magnitude comparator
- (C) one bit parity comparator (D) two bit parity comparator

30. In a coin tossing experiment, if the coin shows head, 1 dice is thrown and the result is recorded. But if the coin shows tail, 2 dice are thrown and their sum is recorded. What is the probability that the recorded number will be 2.

- (A) $11/72$ (B) $7/72$ (C) $5/72$ (D) $7/36$

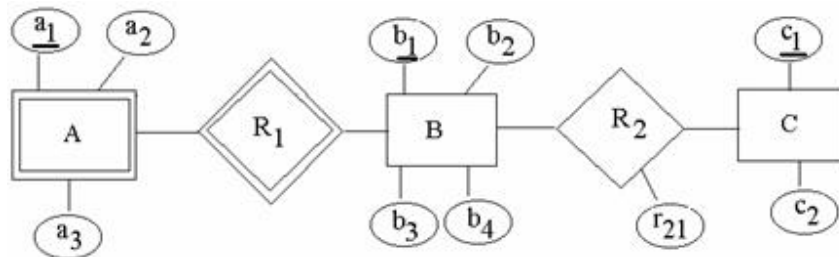
31. For the integral $I_n = \int x^n e^x dx$ which one of the following recursion relation is true?

- (A) $I_n = 2x^n e^x - nI_{n-1}$ (B) $I_n = x^n e^x - (n-1)I_{n-1}$
 (C) $I_n = \frac{x^n e^x}{2} - nI_{n-1}$ (D) $I_n = x^n e^x - nI_{n-1}$

32. Consider a logical address space of 64 pages of 2048 words each, mapped unto a physical memory of 32 frames. How many bits are there in logical address?

- (A) 16 (B) 15 (C) 17 (D) 21


33. Convert the following ER – diagram into a relational database (the primary keys are underlined):



- (A) $A(\underline{a_1}, \underline{b_1}, a_2, a_3)$
 $B(\underline{b_1}, b_2, b_3, b_4)$
 $C(\underline{c_1}, r_{21})$
 $D(\underline{b_1}, \underline{c_1})$
- (B) $A(\underline{a_1}, \underline{b_1}, a_2, a_3)$
 $B(\underline{b_1}, b_2, b_3, b_4)$
 $C(\underline{c_1}, c_2, r_{21})$
 $D(\underline{b_1}, \underline{c_1})$
- (C) $A(\underline{a_1}, \underline{b_1}, a_2, a_3)$
 $B(\underline{b_1}, b_2, b_3, b_4)$
 $C(\underline{c_1}, c_2, r_{21})$
 $D(\underline{b_1}, \underline{c_1}, r_{21})$
- (D) $A(\underline{a_1}, \underline{b_1}, a_2, a_3)$
 $B(\underline{b_1}, b_2, b_3, b_4)$
 $C(\underline{c_1}, c_2)$
 $D(\underline{b_1}, \underline{c_1}, r_{21})$

34. For example, consider the following interleaved schedule of two transactions:

Time T1 T2



```

Sum = 0
Read (X)
X =X + 100
Write(X)
Read(X)
Sum = Sum + X
Read(Y)
Sum = Sum + Y
Read(Y)
Y = Y - 100
Write(y)

```

This is an example of

- (A) Lost update problem
- (B) Inconsistent Read or Temporary Update or Dirty Read problem:
- (C) Phantom Phenomenon
- (D) None

35. Consider the following database with primary keys underlined

```

Project(P_No, P_Name, P_Incharge)
Employee(E_No, E_Name)
Assigned_To(P_No, E_No)

```

Write the relational algebra for the following: List details of the employees working on all the projects.

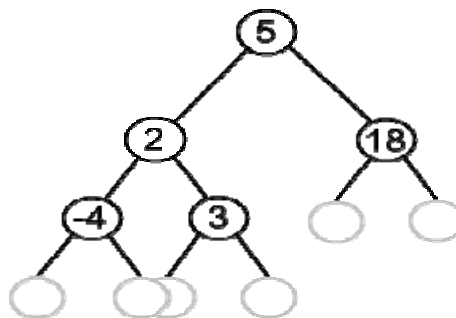
- (A) $\Pi_{E_No, E_Name} (Project \bowtie Employee \bowtie Assigned) \div \Pi_{E_Name} (Employee)$
- (B) $Employee \bowtie (incharge) + \Pi_{p_no} (Project)$
- (C) $Employee \bowtie (Project) \div \Pi_{p_no} (incharge)$
- (D) $Employee \bowtie (Assigned_To) \div \Pi_{p_no} (Incharge)$

36. The order of runtime complexity of $T(n)$ given below is

$$T(n) = 2T(n/2) + n \log n$$

- (A) $n \log^2 n$ (B) $n \log n$ (C) $\log^2 n$ (D) n

37. If we insert 4 in the BST shown below, then its position in the final tree is



- (A) Right to node 3 (B) left to node -4 (C) Right to node 18
(D) left to node 18

38. What will be output if you will execute following c code?

```

#include<stdio.h>
int main(){
    int x=25;
    if(!x)
        printf("%d",!x);
    else
        printf("%d",x);
    return 0;
}
  
```

- (A) 0 (B) 25 (C) 1 (D) -1

39. What will be output if you will execute following c code?

```

#include<stdio.h>
void main(){
    int a=5;
    {
        int b=10;
        ++b;
        ++a;
    }
    int a=20;
}
  
```

```

    ++a;
    a=++b;
}
++a;
++b;
printf("%d %d",a,b);
}
printf(" %d",a);
}

```

- (A) 7 13 7 (B) 13 13 13 (C) 13 13 5 (D) 6 13 5

40. Consider a grammar with the following productions

$$S \rightarrow a a b \mid b a c \mid aB$$

$$S \rightarrow \alpha S \mid b$$

$$S \rightarrow a a b \mid b a c \mid aB$$

$$S\alpha \rightarrow bdb \mid b$$

The above grammar is

- (A) Context free (B) Regular (C) Context sensitive (D) LR(k)

41. Consider a grammar:

$$G = (\{x, y\}, \{s, x, y\}, p, s)$$

Where elements of parse:

$$S \rightarrow xy$$

$$S \rightarrow yx$$

$$x \rightarrow xz$$

$$x \rightarrow x$$

$$y \rightarrow y$$

$$z \rightarrow z$$

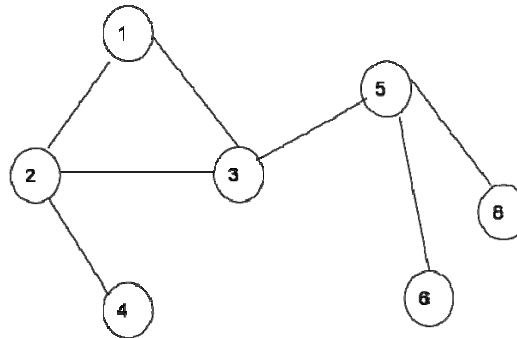
The language L generate by G most accurately is called

- (A) Chomsky type 0 (B) Chomsky type 1
(C) Chomsky type 2 (D) Chomsky type 3

42. Which of the following regular expressions denotes a language comprising all possible strings of even length over the alphabet (0,1)?

- (A) $(0|1)^*$ (B) $(0|1)(0|1)^*$ (C) $(00|01|1|10)^*$ (D) $(0|1)(0|1)(0|1)^*$

43. Number of articulation points of the following graph is

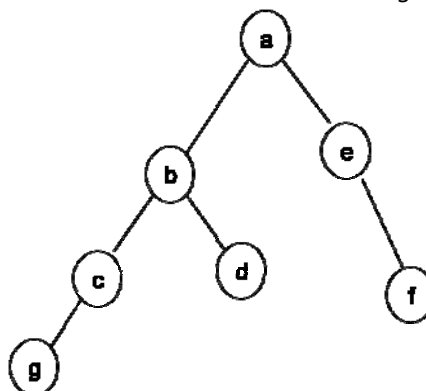


- (A) 0 (B) 1 (C) 2 (D) 3

44. The languages $L = \{0^n 1^n 2^n \text{ where } n > 0\}$ is a

- (A) Context free language
(B) Context-sensitive language
(C) Regular language
(D) Recursive enumerable language

45. In the balanced binary tree in figure given below how many nodes will become unbalanced when a node is inserted as a child of the node "g"?

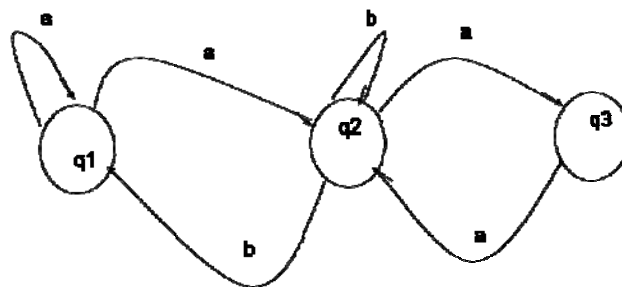


- (A) 1 (B) 3 (C) 7 (D) 8

46. The set $\{a^n b^n \mid n = 1, 2, 3, \dots\}$ can be generated by the CFG

- (A) $S \rightarrow ab|asa$
- (B) $S \rightarrow aaSbb+ab$
- (C) $S \rightarrow ab|aSb|E$
- (D) $S \rightarrow aaSbb|ab|aabb$

47. Which string recognizes it?



- (A) $(a + a(b + aa)^*b)(b + bb)^*a$
- (B) $a + a(b + aa)^*ba(b + aa)^*a$
- (C) $a + a(a + bb)^*(a + (b + aa)^*)^*$
- (D) None of these

Common data question

Common data for question 48 and 49

Given the relations Staff (staff No, position, salary) and Property (number, rent, staff No) given below. The staff looks after a given property.

Staff

Staff No	position	salary
SL21	Manager	50000.00
SL37	Assistant	15000.00
SG14	Supervisor	25000.00
SG5	Manager	45000.00

Property

Number	Rent	Staff No
PA14	5000.00	SL21
PG4	6000.00	SG5
PL94	10000.00	SL21

48. The result for the SQL queries given below is

```
SELECT staff No
FROM Staff
WHERE salary > (SELECT AVG(salary) FROM Staff)
```

- | | | | |
|-----|----------------------------------|-----|----------------------------------|
| (A) | Staff No
SL21
SG5 | (B) | Staff No
SL 14
SG 5 |
| (C) | Staff No
SL21
SL 14 | (D) | Staff No
SL37
SL21 |

49. The result for the SQL queries given below is

```
SELECT staff No
FROM Property
GROUP By staff No
HAVING COUNT(*) > 1
```

- | | | | |
|-----|-------------------------|-----|--------------------------|
| (A) | Staff No
SL21 | (B) | Staff No
SL 14 |
| (C) | Staff No
SG5 | (D) | Staff No
SL37 |

Common data for questions 50 and 51

Given R (A, B, C, D, E) with the set of FDs,

F {AB→CD, ABC → E, C → A}

50. The two candidate keys of R are

- | | | | | | |
|-----|------------|-----|------------|-----|-----------|
| (A) | AD and ABC | (B) | AE and BCD | (C) | AB and BC |
| (D) | ACD and BE | | | | |

51. The normal form of R is

- (A) 1NF (B) 2NF (C) 3NF (D) BCNF

Statement for Linked answers Question 52 and 53:

Suppose there are 16 virtual pages and 4 page frames and the reference string 1 2 3 4 2 1 5 6 2 1 2 3 7 6 3 2 1 2 3 6 if the page frames are initially empty.

52. The number of page faults that will occur with FIFO page replacement algorithms are

- (A) 12 (B) 10 (C) 14 (D) 8

53. The number of page faults that will occur with LRU optimal page replacement algorithms are

- (A) 12 (B) 10 (C) 14 (D) 8

Statement for Linked answers Question 54 and 55

Suppose that the ALOHA protocol is used to share a 56 kbps satellite channel. Assume that frames are 1000 bits long and the propagation delay is 500ms.

54. The maximum throughput of the system in frames/second is case of Pure ALOHA is

- (A) 6 frames/sec (B) 12 frames/sec
(C) 10 frames/sec (D) 18 frames/sec

55. The maximum achievable throughput of CSMA-CD on a similar channel (assuming you could do CD) is

- (A) 40 frames/sec (B) 30 frames/sec
(C) 60 frames/sec (D) 50 frames/sec

General Aptitude Questions One Mark

56. Question 43: If $\log_{12} 27 = a$ and $\log_6 16$ is

- (A) $\frac{3-a}{4(3+a)}$ (B) $\frac{3+a}{4(3-a)}$ (C) $\frac{3+a}{(3-a)}$ (D) $\frac{4(3-a)}{(3+a)}$

57. 15: In a hotel 60% had vegetarian lunch while 30% had non-vegetarian lunch and 15% had both type of lunch. If 96 people were present, how many did not eat to either type of lunch?

- (A) 20 (B) 24 (C) 26 (D) 28

58. A trademan gives 4% discount on the marked price and gives 1 article free for buying every 15 articles and thus gains 35%. The marked price is above the cost price by:

- (A) 20% (B) 39% (C) 40% (D) 50%

59. A cricketer has a certain average for 10 innings. In the eleventh inning, he scored 108 runs, thereby increasing his average by 6 runs. His new average is:

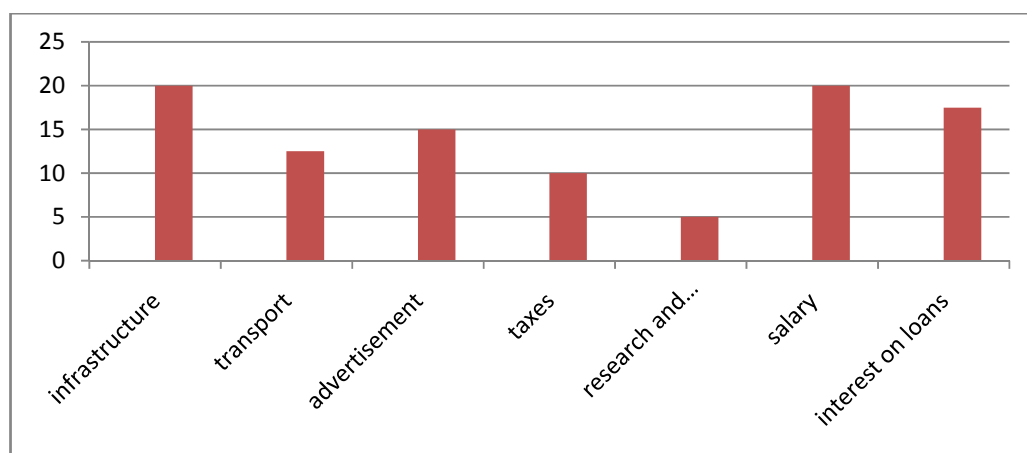
- (A) 48 runs (B) 42 runs (C) 55runs (D) 60 runs

60. David invested certain amount in three different schemes A, B and C with the rate of interest 10% p.a., 12% p.a. respectively. If the total interest accrued in one year was Rs. 3200 and the amount invested in Scheme C was 150% of the amount invested in Scheme A and 240% of the amount invested in Scheme B, what was the amount invested in Scheme B?

- (A) Rs 5000 (B) Rs. 6500 (C) Rs. 8000 (D) cannot be determine

General Aptitude Questions Two Marks

The bar graph given below shows the percentage distribution of total expenditures of a company under various expense heads during 2011. Study the graph and answer the question that follows.



61. What is the ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans?

- (A) 5:4 (B) 8:7 (C) 9:7 (D) 13:11

62. The total amount of expenditures of the company is how times the expenditure on research and development?

- (A) 27 (B) 20 (C) 18 (D) 8

63. Find the word which has closest meaning to **SATURNINE**.

- (A) Taciturn (B) Amicable (C) Bad (D) Genuine

64. Find the antonyms of **SPURIOUS**.

- (A) Interference (B) Genuine (C) Meretricious (D) Mock

65. Find the appropriate pair

- (A) Gullible-Cheated (B) Nausea-Relax (C) Jeopardy-Style (D) Peril-Bestow