Institute of Mathematics and Applications, Bhubaneswar
Entrance Test-2012
M.A./M.Sc. : Computational Finance

Max Marks: 100   Max Time: Two Hours

(*Group A*)

All questions are compulsory. Questions in this group carry 3 marks each. Choose the right alternative from among the given alternatives. For incorrect answer -1 mark will be awarded.

1. If x earns 25% more than y by what percent y earns less than x ?

    A. 16%

    B. 18%

    C. 20%

    D. 25%

2. A reduction of 20% in the price of rice enables a person to buy 3.5 kg more for Rs. 77. What is the original price per kg ?

    A. Rs. 4.00

    B. Rs. 4.50

    C. Rs. 5.00

    D. Rs. 5.50

3. A dealer marks his goods 30% above the cost price but allows a discount of 15% for cash payment. What is the percentage of gain ?

    A. 15%

    B. 9%

    C. 8.5%

    D. 7.5%

4. In how many years will Rs. 1000 become Rs. 1331 at the rate of 10% compounded annually ?

    A. 4

    B. 3

    C. 2

    D. 1

5. A, B and C subscribe Rs. 45,000 for a business. A subscribes Rs. 5000 more than B and B subscribes Rs. 5000 more than C. What is B's share of the annual profit of Rs. 9000 ?

    A. Rs. 3000

    B. Rs. 2000

    C. Rs. 1500

    D. Rs. 1000

6. If $x^2 = \dfrac{1}{x^2} + 1$ then $x^2 + \dfrac{1}{x^2}$ is equal to

    A. 5

    B. $\pm\sqrt{5}$

    C. $\sqrt{5}$

    D. 0

7. If $3^{x-y} = 27$ and $3^{x+y} = 243$, then x is equal to

    A. 0

    B. 2

    C. 4

    D. 8

8. If $x + 3$ divides $x^3 + 5x^2 + kx$, then k is equal to

    A. 6

    B. 4

    C. 2

    D. 8

9. The solution of the equation $7^{1+x} + 7^{1-x} = 50$ is

    A. 0

    B. ± 1

    C. 2

    D. none of the above

10. The solution of the inequation $|2x - 6| \leq 6$ is

    A. $x \leq 6$

    B. $0 \leq x \leq 6$

    C. $-6 \leq x \leq 6$

    D. not defined

11. *A* walks a distance of 3 km towards north, then turns to his left and walks for 2 km. He again turns left and walks for 3 km. At this point, he turns to his right and walks for 3 km. How many kilometers and in what direction is he from the starting point ?

    A. 5 km and west

    B. 3 km and south

    C. 2 km and south

    D. 1 km and east

12. A three centimeters cube has been painted red on all its sides. It is cut into one centimeter cubes. How many cubes have two sides painted ?

    A. 4

    B. 6

    C. 8

    D. 12

13. If each side of a rectangle is increased by 50% its area will increase by

    A. 50%

    B. 125%

    C. 100%

    D. 0%

14. What is the next term in the following sequence ?

$$1, 1, 2, 3, 5, 8, 13, 21$$

    A. 34

    B. 40

    C. 29

D. none of the above

15. Let $\times$ = greater than, $\triangle$ = less than, $\square$ = not less than and $+$ = not greater than. If $p \times q \square r$, then which of the following is true ?

      A. $p \triangle q \times r$

      B. $p \square q \times r$

      C. $p \square q \triangle r$

      D. $p + q \times r$

16. Consider the following statements:
I. None but the rich can afford air travel.
II. Some of those whose travel by air become sick.
III. Some of those who become sick require treatment.
If the above statements true, then which one of the following conclusion is true ?

      A. All the rich persons travel by air.

      B. Those who travel by air become sick.

      C. All the rich persons become sick.

      D. All those who travel by air are sick.

      E. None of the these.

17. Consider the following statements:
Amit and Subash are friends. Subash is friendly with all. Amit has many enemies. Rahul and Amit do not like each other.
Conclusions:
I. Amit, Rahul and Subash are mutual friends.
II. Rahul and Subash are friends.
III. Subash is friendly with Amit's friends.
IV. Amit and Rahul are both friends of Subash.
Based on the above statements and conclusions, which one of the following is true ?

      A. Conclusions I and III are true.

      B. Conclusions I and II are true.

      C. Conclusions I, III and IV are true.

      D. Conclusions I, II and III are true.

      E. None of I, II, III and IV are true.

18. Whenever Rahul sings, Harish gets a headache and Rupaj groans. If Rupaj is not groaning, which one of the following statements must be true ?

    A. Rahul is singing and Harish has a headache.

    B. Harish has a headache but Rahul is not necessarily singing.

    C. Rahul has been singing and Harish is beginning to get a headache.

    D. Rahul is not singing.

    E. Rahul is singing but Harish not necessarily have a headache.

19. Studies of fatal automobile accidents reveal that, in the majority of cases in which one occupant of an automobile is killed while another survives. It is the passenger, not the driver who is killed. It is ironic that the innocent passenger should suffer for the driver's carelessness, while the driver often suffers only minor injuries or none at all.
    Which of the following is an assumption underlying the reasoning in the passage above ?

    A. In most fatal automobile accidents, the driver of a car in which an occupant is killed is at fault.

    B. Drivers of automobiles are rarely killed in auto accidents.

    C. Most deaths in fatal automobile accidents are suffered by occupants of cars rather than by pedestrians.

    D. Auto safety experts should increase their efforts to provide protection for those in the passenger seats of automobiles.

    E. Automobiles passengers sometimes play a contributing role in causing auto accidents.

20. Opening a plant in war-torn Country X is not inadvisable, despite what critics of the plan may say. Ten years ago, we opened our plant in Country Y in the middle of a revolution; that plant has been generating successful profits ever since.
    Which one of the following is the author of the argument above most reasonably intending the reader to conclude ?

    A. Wars are profitable for the author's particular business.

    B. Country X is more stable nation than Country Y.

    C. Critics of the proposed plant in Country Y are likely to be biased.

    D. The proposed plant in Country X will generate profits, despite war.

    E. The proposed plant in Country X will be more successful than in Country Y.

All questions are compulsory. Each question carries +4 marks. *NO NEGATIVE* marking. Only write down the answer. Calculations may be done in the rough work paper attached in the answer sheet.

1. A rectangle of largest area is inscribed in a semi circle of radius 2 units. What is the area of the rectangle thus inscribed ?

2. If the sum of two nonzero numbers is 8, then what is the minimum of the sum of their reciprocals ?

3. In how many ways can 6 boys and 5 girls sit in a row if the girls are to sit together and the boys do not sit together ?

4. If a coin is tossed thrice then what is the probability of getting at most two heads ?

5. Let d be the standard deviation of n observations. If each observation is multiplied by 4 then what is the standard deviation of the resulting data ?

6. If $\begin{vmatrix} x & 0 & 0 \\ y & 7 & 1 \\ 8 & 4 & 2 \end{vmatrix} = 20$, then determine all values of x and y.

7. If $A = \begin{pmatrix} \alpha & 0 \\ 1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$, then for what value of α is $A^2 = B$?

8. If $y = \sin^2(e^x) + \sin^2(\frac{\pi}{2} + e^x)$. What is the value of $\dfrac{dy}{dx}$?

9. If $\int_0^1 f(x)\,dx = 4$, $\int_0^2 f(t)\,dt = 2$ and $\int_2^4 f(u)\,du = 1$, then what is the value of $\int_1^4 f(x)\,dx$?

10. What is the area enclosed by the parabola $y^2 = 2x$ and the line $y = 2x$?