

2020**FUNDAMENTALS OF BUSINESS MATHEMATICS**

Full marks : 100

Time : 3 hours

General instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.

ii) The question paper consists of 26 questions. All questions are compulsory.

iii) Marks are indicated against each question.

iv) Internal choice has been provided in some questions.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

1. Define a mixed surd. 1
2. What is meant by slope of a line? 1
3. Express $\log_3 243 = 5$ into exponential form. 1
4. Prove that $0 \neq 1$ 1
5. Evaluate $C(10,4)$ 1
6. What is meant by prime number? 1
7. Simplify $\frac{x^{-6}y^6}{x^6y^{-6}} \times \frac{x^{-2}y^2}{x^2y^{-2}}$ 4
8. Find the equation of a straight line passing through the origin and perpendicular to the line $4x - 5y - 7 = 0$ 4
9. If the production function of a firm is $X=100 L^{0.3} K^{0.7}$
Where X is the output; L is the labour and K is the capital input; find the production (X)
When
L=50units and K=600units
[$\log 50=1.7$, $\log 600=2.78$ AL(4.456)=28,580] 4
10. Find the number of permutations of the letters of the word 'COMMERCE' can be arranged. 4

11. A committee of 6 members is to be formed from 7 students and 4 teachers. In how many ways can this be done when the committee must contain at least 2 teachers. 4

12. Mr. Avikho walks 2.5km due east and then 3.2km due north. Find his distance from the starting point correct to 2 places of decimal. 4

13. a. If $a + b + c = 0$, show that

$$\frac{1}{x^b + x^{-c} + 1} + \frac{1}{x^c + x^{-a} + 1} + \frac{1}{x^a + x^{-b} + 1} = 1$$

Or

4

- b. If $a=2$, find the value of $[1 - \{1 - (1 - a^3)^{-1}\}^{-1}]^{-\frac{1}{3}}$

14. a. The simple interest on a sum of money at the end of 5 years is $\frac{3}{8}$ of the sum itself. Find the rate of interest percent per annum. 4

Or

- b. A certain sum of money amount to ` 5,750 in 5 years and to ` 6,050 in 7 years both at simple interest. Find the sum and rate of interest.

15. a. Find the compound interest for ` 2,000 for 5 years at 5% per annum compounded semi annually. 4

Or

- b. Find the effective rate of interest corresponding to a nominal rate of $3\frac{1}{4}\%$ per annum interest payable quarterly.

16. a. If 20% of a number is added to 16, the result is the number itself. Find the number. 4

Or

- b. A man in business losses in his first year 5% of his capital, but in the second year he gains 10% of what he had at the end of the first year and his capital is now ` 180 more than that at the commencement. Find his original capital.

17. a. An article is sold at a loss of ` 500 which represents 10% of the selling price? What is the cost price? At what price should the article be sold so that he can make a profit of 10% on cost price? 4

Or

- b. By selling 200 apples, a man gains the selling price of 20 apples. Find his gain percent.

18. a. Find the equation of the line joining the origin to the point of intersection of $3x - 4y + 6 = 0$ and $5x + y - 13 = 0$

Or 5

- b. Find the equation of the circle passing through the points (1, 1), (2, -1) and (3, 2).

19. a. Show that $3\log\frac{36}{25} + \log\left(\frac{6}{27}\right)^2 - 2\log\frac{16}{125} = \log 2$

Or 5

- b. If $a^2 + b^2 = 7ab$ show that $\log\left\{\frac{1}{3}(a+b)\right\} = \frac{1}{2}(\log a + \log b)$

20. a. Suppose a license plate contains 3 distinct letters followed by four digits with the first digit not zero. How many different license plates can be printed?

Or 5

- b. In how many ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels remain together?

21. a. After walking $1\frac{2}{3}$ km, a man has performed completely

$1 - \left[5 \div \left\{3 \times 5 \div \left(6 \times \frac{5}{2} - 2\right)\right\}\right]$ of $0.\dot{3}$ of his journey. How far has he still to walk?

Or 5

- b. Simplify

$$\frac{\frac{19}{111} + \frac{27}{37}}{1 - \frac{19}{111} \times \frac{27}{37}} - \frac{\frac{16}{17} - \frac{15}{16}}{1 + \frac{16}{17} \times \frac{15}{16}} \text{ of } \frac{1}{3} - \frac{1}{9} \text{ of } \frac{1}{3}$$

22. a. If $x = \frac{\sqrt{1+2a} + \sqrt{1-2a}}{\sqrt{1+2a} - \sqrt{1-2a}}$, prove that $ax^2 - x + a = 0$

Or 6

- b. If $x = \frac{2ab}{a+b}$, prove that $\frac{x+a}{x-a} + \frac{x+b}{x-b} = 2$

23. a. A father leaves ₹ 94,000 in a bank at 10% simple interest for his three sons A, B and C and their ages being 3, 8 and 13 years old respectively. If each gets the same amount at the age of 18, find their shares at the father's death.

Or 6

- b.** A businessman lent ₹ 50,000 to two persons in two parts. The first person borrowed at 4% and the second person borrowed at 5% interest per annum. If the businessman received ₹ 61,000 as total amount after 5 years, then what sum was borrowed by each of the two persons?
24. **a.** In 2000, the capital of a company was ₹ 6.2×10^8 . After 3 years, the capital rise to ₹ 7.5×10^8 . Calculate the half yearly rate of growth of the capital. [Log 1.21 = 0.0828, AL (.0138 = 1.032)]
- Or** **6**
- b.** A father left ₹ 80,000 to his two daughters so that the elder should receive her amount in 5 years time and the younger in 7 years time, the two amount being equal when received. If the interest compounded at 5% per annum, find how much did the father leave for each. How much money each should receive?
25. **a.** A sum of ₹ 12,560 is divided among 7 men, 12 women and 18 boys. Each man receives twice as much as a woman and the 12 women receives as much as 40 boys. What is the share of each?
- Or** **6**
- b.** A man left $\frac{3}{8}$ of his property to his wife, $\frac{1}{5}$ to his son and the remainder was divided between his two daughters are respectively 16 years and 18 years and if the elder daughter got ₹ 1,800, how much did each of the other get?
26. **a.** A person in the first year of his business makes a profit of 20% on his capital and in the second year sustains a loss of 20% on his new capital. Does he gain or loss in the long run? Would it be the same if he had loss 20% in the first year and gained 20% in the second year?
- Or** **6**
- b.** A piano was sold at a loss of 20% on cost price, a second was bought with the proceeds plus ₹ 300 paid; this was also sold at a loss of 15% ; a third one was bought with the proceeds plus ₹ 400. The third piano cost ₹ 4,000. What was the cost of the first piano?
