GLOBAL COLLEGE OF MANAGEMENT

FIRST TERM EXAM-2070

Grade: XII Subject: Business Mathematics F.M.:100
Time: 3:00 hrs. P.M.:40

Set A

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.
Attempt all the questions:

Group-A [10×2×3 = 60]

1. a. Express $\frac{2-\sqrt{-25}}{1-\sqrt{-16}}$ in A+ *i*B form. Also, find A and B.
   b. If $x = 2$ and $y = -3$ show that $|x+y| \leq |x| + |y|$

2. a. In a market survey of 1000 consumers of tea it was found that 500 purchased Soktim tea, 400 purchased Tokla tea and 200 purchased both the brands. How many purchased
   (i) Soktim only (ii) Tokla only (iii) neither of them?
   b. If $f(x) = \frac{-x+3}{|x|-2}$ when domain = {–3,-5, 3} find the range.

3. a. Find the first term and common difference of an A.P. whose 7th and 15th terms are $\frac{37}{16}$ and $\frac{11}{2}$ respectively.
   b. A person borrows Rs. 19682 and pays it back in 9 annual installments, each installment being double of the preceding one. Find the first Installment.

4. a. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, prove that (A - 2I) (A - 3I) = O, where I and O are 2×2 unit and null matrix.
   b. Solve by using Cramer's rule $3x - 2y = 1$; $-x + 4y = 3$.

5. a. Find equation of the locus of a point which moves so that it is equidistant from the points (–1, –2) and (3, 4).
   b. Find the equation of the line which passes through the origin and the point of intersection of $2x - 3y + 1 = 0$ and $x + 2y = 3$.

6. a. If the points (–1, 0), (3, 1), and (2, 2) are the three vertices of a parallelogram. Find the fourth vertex.
   b. Evaluate: $\lim_{x \to a} \frac{\sqrt{3a-x} - \sqrt{x+a}}{4(x-a)}$

7. a. Evaluate: $\lim_{x \to 64} \frac{\sqrt[6]{x} - 2}{\sqrt[3]{x} - 4}$
   b. Find the differential coefficient of $\frac{1}{\sqrt{x+a} + \sqrt{x-a}}$

8. a. Find the derivative of: $e^{2x} \ln 2x$
   b. Find $\frac{dy}{dx}$, if $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $x = a$.

9. a. Ram and Mohan hired pasture for Rs.65 for 17 days. Ram puts in 8 cows for a certain number of days and pays Rs.44. Mohan puts in 7 cows for the remaining number of days and puts the remaining sum. For how many days does Mohan put his cows?
   b. A and B invest Rs. 10,000 and Rs. 12000 as capital in business. A is the only working partner and is paid for both supervision and capital and B is paid for capital only. Out of a total profit Rs. 1440 they receive profits in the ratio 4:3. How much is allowed to A for supervision.

10. a. The weight of 20 franc pieces is 2 grams 9/10 fine that of £ 1 is 123.227447 grains 11/12 fine. Assuming 1 gram. = 15.432 grains, find the mint par of exchange between £ and Francs.
    b. The difference between the banker's discount and true discount on a bill for 7½ months at 5% is Rs. 2 find the amount of the bill.

Group - B [8×5 = 40]

11. The rate of monthly salary of a man increases annually in A.P. He was drawing Rs. 400 per month during the eleventh year of his service and Rs. 760 per month during the 29th year of service. Find his salary in 9th year and in 9years.

12. Prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a + b + c)^3$

13. A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} 3+2x & for \quad -\frac{3}{2} \le x < 0 \\ 3-2x & for \quad 0 \le x < \frac{3}{2} \\ -3-2x & for \quad x \ge \frac{3}{2} \end{cases}$$

Show that $f(x)$ is continuous at $x = 0$ and discontinuous at $x = \frac{3}{2}$.

14. Find from first principle, the derivative of $\frac{1}{\sqrt{2x+3}}$ with respect to x.

15. In a race of 1 km. A beats B by 100 m. , B beats C by 50 m. , C beats D by 40 m. , Find by how many meters will A beat C and D?

16. Ram, Shyam and Hari form a business with capitals Rs.5,000, Rs.4,500 and Rs.6,500 respectively. After 6 months, Ram doubles his capital and after next three months Shyam trebles his capital. If the profit at the end of the year amounted to Rs.8,300, find the profits obtained by each of Ram, Shyam and Hari.

17. A Kathmandu merchant owes 5,100 Bhats to merchant in Bangkok, the rate of remitting the amount by T.T. is Rs.424 per 100 Bhats while the rate of remitting through the amount by sight draft is 0.24 Bhat for a rupee. Which is the cheaper method and how much does he gain by remitting the amount through cheaper method?

18. A bill was drawn on February 25, 1997 for Rs. 875 at 7 months, and is discounted on May 5 1997. What was the rate of banker's discount, if the banker deducted Rs. 17.50 as his interest?

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Set B

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Attempt all the questions:

Group-A [10×2×3 = 60]

1. a. If $x - iy = \frac{2-3i}{2+3i}$, prove that: $x^2 + y^2 = 1$
   b. Rewrite using absolute value sign: $-8 < x < -1$

2. a. In a collage, 40% of students play basketball, 25% play volleyball and 10% play both. What percent of students play (i) exactly one game (ii) neither?
   b. If $f(x) = \frac{|x|}{x} + |x|$, find f(1), $f(-\frac{1}{2})$, f(–1).

3. a. Three numbers are in the ratio of 1:2:4. If 3 is added to the first and 8 is subtracted from the third, the numbers will be the first and the third term of an A.P. whose second term is the second number. Find the original numbers.
   b. In a G.P., the first term is 7, the last term 448 and the sum 889, find the common ratio.

4. a. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$, evaluate: $A^2 - 4A - 5I$, where I is 2×2 identity matrix.
   b. Construct a 2×2 matrix whose elements a_{ij} are given by $a_{ij} = 2i - 3j$.

5. a. The centroid of a triangle is (2, 3), If its two vertices are (-1, -3) and (6, 10). Find the third vertex.
   b. Find the equation of the straight line passing through the intersection of 2x – 3y + 8 = 0 and 4x + 5y – 6 = 0, having a slope $= -\frac{2}{3}$.

6. a. Find the equation of a straight line passing through the point (2,3) and making equal intercepts on the axes but opposite in sign.
   b. Evaluate: $\lim_{x \to 3} \left(\frac{1}{x-3} - \frac{9}{x^3 - 3x^2} \right)$

7. a. Test the continuity or discontinuity of the function defined by.
   $$f(x) = \begin{cases} x^2 + 2 & \text{for } x \leq 5 \\ 3x + 12 & \text{for } x > 5 \end{cases} \quad \text{at } x = 5.$$
   b. Find $\frac{dy}{dx}$, if $x = \frac{3t}{1+t^3}$, $y = \frac{3t^2}{1+t^3}$

8. a. If $y = \frac{\ln ax}{e^{ax}}$, find $\frac{dy}{dx}$.
   b. Find $\frac{dy}{dx}$, if $x^3 + y^3 = 3axy$.

9. a. If a:b = 3:4, b:c = 4:5 and c:d = 7:9, then find a:d and a:b:c:d.
   b. Mohan and Sohan started business with capitals Rs. 2,500 and Rs. 3,000 respectively. Of a total profit of Rs.1000, Sohan who had contributed his capitals for 5 months receive Rs.650. Find how long Mohan has contributed his capitals.

10. a. Determine the par of exchange between London and New York if £1 contained 61.635 grains of gold 11/12 fine and $1 contained 25.8 grains of gold 9/10 fine.
    b. Nitesh draws a 4 months bill for Rs.1500 and discounts it with a bank on the same day at 9% p.a. Find what does he receives from the bank.

Group - B [8×5 = 40]

11. If the 6^{th} and 13^{th} terms of a G.P. are 64 and 8192 respectively. Find the 11^{th} term and the sum of the first 11 terms.

12. Solve the equations using Cramer's rule:
x + y + z = 4, 2x + y = 1 and 2x + 2y = 2.

13. A function $f(x)$ is defined as follows:

$$f(x)=\begin{cases} 2x^2+1 & \text{for} \quad -2 \le x < 0 \\ 3x+1 & \text{for} \quad 0 \le x < 2 \\ 5x-3 & \text{for} \quad x \ge 2 \end{cases}$$

Discuss the continuity or discontinuity of $f(x)$ at $x = 0$ and at $x = 2$.

14. Find from first principle the derivative of $\sqrt{ax + b}$.

15. The cost raw of materials in a factory increased in the ratio of 5:12 and working expenses in the ratio of 3:5. Find the prime cost of the article which was previously made for Rs.35.61of which one third was the cost of raw material?

16. Mani and Bijaya invested Rs. 60,000 and Rs. 36,000 in a firm. They agreed to receive 10% interest on their capital. Out of annual profits, the remaining profit is shared in the ratio of their capitals. If Mani receives a total amount of Rs. 16,500, find Bijaya's share.

17. A student going to Australia changed his entire amount Rs. 44992 in to Australian dollars at the rate of 1 Australian dollar = Rs. 56.24. He spent 400 Australian dollars in Australia. On returning to Nepal he changed the amount left with him and got Rs. 22600. Find the new rate of exchange between Nepal and Australia.

18. Find the difference between banker's discount and true discount on a bill. If the same bill is discounted by a bank for 3 months at 5% p.a., the holder of the bill receives Rs. 15059.375.