GLOBAL COLLEGE OF MANAGEMENT

Second Term Exam-2071

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

Set- I

Attempt **all** questions:

Group 'A' **[10×2×3=60]**

1. a) Find the modulus of $z = \frac{(1-i)^3}{1-i^3}$

   b) Let $A = \{1, 2, 3\}$. Find the relation in $A \times A$ satisfying the condition $x > y$ for all $(x, y) \in A \times A$. Find the domain of the relation.

2. a) Starting salary of a man is Rs. 7,200 per month. If he gets an increment of Rs. 200 every year, what will his salary be in the 10^{th} year?

   b) The sum of a series in G.P. whose common ratio is 3, is 728 and the last term is 486. Find the first term.

3. a) In how many ways can the letters of the word 'COMMERCE' be arranged?

   b) In how many ways of 5 members committee be selected from 6 men and 5 women consisting of 3 men and 2 women?

4. a) Where does the straight line through (3, 4) and (5, 6) intersect y-axis?

   b) Prove that the points (4, 8), (0, 2), (3, 0) and (7, 6) are the vertices of a parallelogram.

5. a) If $A = \begin{pmatrix} 2 & 3 \\ -1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 2 \\ 5 & -3 \end{pmatrix}$. Find AB and BA.

   b) Find the limit of: $\lim_{x \to 5} \frac{x-5}{\sqrt{4x+5}-5}$

6. a) Examine the continuity of the following function at the point $x = 3$.

$$f(x) = \begin{cases} \frac{x^2-9}{x-3} & \text{when} \quad x \neq 3 \\ 6 & \text{when} \quad x = 3 \end{cases}$$

   b) Find $\frac{dy}{dx}$ if $x = at^3$, $y = 3at$

7. a) Find $\frac{dy}{dx}$ if $y = x^3 . e^{x^2}$

   b) Show that $y = x^2 - 6x + 4$ is an increasing function at $x = 8$, decreasing at $x = 1$.

8. a) Integrate: $\int \frac{1}{\sqrt{x+a} - \sqrt{x-b}} \, dx$

   b) Evaluate: $\int_0^1 x^3 \sqrt{1+2x^4} \, dx$

9. a) The marginal cost of production is found to be: $MC = 2{,}000 - 40x + 3x^2$, where x is the number of units produced. The fixed cost of production is Rs. 18,000. Find the cost function.

   b) Calculate the mean deviation from mean of the following frequency table:

Bonus	10	15	20	25
Frequency	3	5	5	7

10. a) If 200 men can make an embankment 5 km, long in 25 days, how much overtime per day must 60 men work to finish an embankment 2 km long in 32 days, 12 hours being a day's regular working hour.

b) An article was sold at its marked price Rs. 6,200 and a discount of 15% was allowed. The dealer still made a profit of 25%. Find the cost price.

Group 'B' **[8×5=40]**

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

12. Find, from the first principle, the derivative of $\frac{1}{\sqrt{5x-3}}$.

13. The demand equation for a certain commodity is $P = \frac{1}{12}q^2 - 10q + 300$. Find the value of q and the corresponding price p that maximize the revenue.

14. Solve the following L.P. problem graphically.
Maximize $(z) = x + y$ subject to the constraints $x + y \geq 3$, $2x + 3y \leq 6$, $x \leq 6$ and $x, y \geq 0$.

15. Following are the marks obtained by two students Ram and Hari in 10 tests of 100 marks each.

Test	1	2	3	4	5	6	7	8	9	10
Mark of Ram	54	60	56	68	72	52	48	76	80	44
Mark of Hari	66	57	51	72	69	63	60	54	75	48

i) Who is more consistent of performance?
ii) Who is better?

16. Ram and Hari start a business with capitals of 5:7. They withdraw respectively $\frac{2}{3}$ and $\frac{3}{4}$ of their capital at the end of 4 and 6 months. At the end of the year a profit of Rs. 2,660 is divided. Find the profits individually.

17. A merchant of Kathmandu imports good worth 15,200 francs, the rate of remitting the amount through T.T. is Rs. 35.50 for a franc, while the rate is 0.29 franc for Rs. 10 if remitting through sight draft. Find which method is cheaper and by what amount?

18. The difference between the true and the banker's discount on a certain bill due three months hence is Rs. 18. The rate of interest being 12%. Find;
i) True discount
ii) Banker's discount
iii) Amount of the bill

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Set- II

Attempt **all** questions:

Group 'A' **[10×2×3=60]**

1. a) If $x = 4 + 5i$ and $y = 4 - 5i$, find the value of $x^2 - xy + y^2$.
   b) In a market survey of 600 consumers of tea, it was found that 300 purchased Mechi tea, 250 purchased Muna tea and 150 purchased both brands. How many purchased neither of them?

2. a) In an arithmetic sequence, the 4th and the 15th terms are 11 and 44 respectively. Find the first term and the common difference.
   b) Insert 3 geometric means between $\frac{16}{9}$ and 9.

3. a) In how many ways can the letters of the word 'EXAMINATION' be arranged?
   b) A person has got 12 friends of whom 8 are relatives. In how many ways can he invite 7 guests such that 5 of them may be relatives?

4. a) Find the equation of the locus of the point which moves so that it is always equidistant from the point (1, 3) and (–2, 6) .
   b) show that the points A (1, 2), B(3, 4) and C(–3, –2) are collinear.

5. a) If $A = \begin{pmatrix} 1 & 0 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 1 \\ 4 & 2 \end{pmatrix}$, Prove that $AB \neq BA$.
   b) Find the limit of $\lim_{x \to 3} \left(\frac{1}{x-3} - \frac{9}{x^3 - 3x^2} \right)$

6. a) Examine the continuity of the following function at the point $x = 5$.
$$f(x) = \begin{cases} \frac{x^2 - 25}{x - 5} & \text{when} \quad x \neq 5 \\ 10 & \text{when} \quad x = 5 \end{cases}$$
   b) Find $\frac{dy}{dx}$ if $x = at^2$, $y = at^4 - 1$

7. a) Find $\frac{dy}{dx}$ if $y = x^3 . \ln(2x)$
   b) Show that $y = x^2 - 6x + 4$ is an increasing function at $x = 8$, decreasing at $x = 1$.

8. a) Evaluate: $\int_0^a x\sqrt{a^2 - x^2}\, dx$
   b) Integrate: $\int \frac{1}{\sqrt{x+a} - \sqrt{x+b}}\, dx$

9. a) If the marginal revenue function for output x is given by: $MR = 6x^2 + 4x + 3$, find the total revenue function. Also deduce the demand function.
   b) Calculate the quartile deviation from the following frequency table:

Bonus	10	15	20	25
Frequency	3	5	5	7

10. a) 20 men can do a piece of work in 24 days. After working for 6 days, an additional number of men is taken to finish the work in 21 days from the beginning. Find the number of additional men?

b) A buys an article and sells it to B at a profit of 10%. B sells it to C at a gain of 20% at C paid Rs. 924 for it, what did A pay for it.

Group 'B' **[8×5=40]**

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

12. Find, from the first principle, the derivative of $\frac{1}{\sqrt{3x-5}}$.

13. Given the demand function $P = 16 - Q$ and the cost function $C = 2 + Q^2$, find the value of maximum profit.

14. Solve the following L.P. problem graphically. Find the extreme values of the function G defined by $G = 10x + 15y$ subject to the constraints $x + 2y \le 20$, $x + y \le 16$, $x \ge 0$, $y \ge 0$.

15. The following are the marks obtained by two students Gopal and Bhupal in 10 tests of 100 marks each.

Test	1	2	3	4	5	6	7	8	9	10
Mark of Gopal	54	60	56	68	72	52	48	76	80	44
Mark of Bhupal	66	57	51	72	69	63	60	54	75	48

i) Who is more consistent of performance?

ii) Who is better?

16. A started business with a capital of Rs. 7,000 in the beginning of the year. After 4 months, he admitted B with a capital of Rs. 6,000, after 6 months, they admitted C with a capital of Rs. 8,000. If the profit at the end of the year amounts to Rs. 15,000, find their profits individually.

17. A student going to Australia for study changed his entire amount of Rs. 44,992 into 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. 22,600, find the new rate of exchange between Nepal and Australia.

18. At what rate is the banker's discount calculated when a bill of Rs. 5,000 is accepted by a bank for Rs. 4,700 due 8 months? Also find Banker's discount and true discount.

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