GLOBAL COLLEGE OF MANAGEMENT

Second Term-2072

Grade: XII **Subject: Business Mathematics** **F.M.:100**

Time: 3 Hrs. **P.M.: 40**

Set A

Group A **[10×2×3=60]**

Attempt all the questions

1. a. If $x-iy=\frac{2-3i}{2+3i}$, prove that $x^2+y^2=1$.

   b. In a certain village in Nepal, all people speak Nepali or Tharu or both languages. If 90% speak Nepali and 20% speak Tharu language, how many speak
   i. Nepali only
   ii. Tharu only

2. a. Insert 4 arithmetic means between 25 and 50.

   b. The sum of the first two terms of an infinite geometric series is 15 and also, the first term is equal to the sum of all the terms following it. Find the series.

3. a. Find the numbers of arrangement that can be made out of letters of the word 'STATISTICS'.

   b. A man has 10 friends of whom 6 are relatives. In how many ways can he invite 5 guests such that 2 of them may be relatives ?

4. a. Show that $A^2+3A+4I=0$ if $A=\begin{pmatrix}-1 & -1\\ 2 & -2\end{pmatrix}$ where I and 0 are unit and zero matrices respectively.

   b. In what ratio is the line joining the points $(3,3)$ and $(-4,2)$ divided by $X-axis$? Also, find the point of intersection.

5. a. Find the equation of the line joining the point of intersection of the lines $x+3y+2=0$ and $2x-y-3=0$ to the point $(3,1)$.

   b. Evaluate: $\lim_{x\to 1}\frac{\sqrt{x+2}-\sqrt{4-x}}{x^2-1}$

6. a. Discuss the continuity or discontinuity of the function:
   $$f(x)\begin{array}{l}=\ 2x+2 \text{ for } x\le 5\\ =\ 3x+12 \text{ for } x>5\end{array}\Big\} \text{ at } x=5$$

   b. Find $\frac{dy}{dx}$ if $\sqrt{x}+\sqrt{y}=4$.

7. a. Find the derivative of $x^3.\log 2x$.

   b. Determine whether the function is increasing or decreasing or stationary at the specified point.
   $f(x)=2x^3-x^2+5$ at $x=1$, $x=3$ and $x=0$.

8. a. Evaluate: $\int\frac{2x+3}{3x-5}\,dx$.

   b. Integrate: $\int_1^e \ln x\ dx$.

9. a. If the marginal revenue function for a out put x is given by $MR=3x^2+2x+5$ find the total revenue function. Also deduce the demand function.

   b. Find the mean deviation from mode and its coefficient:

X:	10	12	15	16	20
F:	6	14	20	13	7

10. a. 30 men were engaged to finish a piece of work in 20 days, but at the end of 15 days $\frac{3}{7}$ of the work remained undone. How many additional men must be employed so as to finish the work in time?

b. A dealer altered his trade discount from 15% to 10%. By what percent was the selling price altered?

Group B **[8×5=40]**

11. Show that: $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$

12. Find, from the first principle, the derivative of: $x+\sqrt{x}$.

13. Given the demand function $p = 20 - Q$ and the total cost function $C = Q^2 + 8Q + 2$, determine optimal output Q, price p, total profit, total revenue R and total cost C under profit maximization.

14. Solve the following LP problems graphically Minimize $Z = 20x + 30y$.
Subject constraints:
$3x + 5y \geq 45$
$2x + y \geq 20$
$x \geq 0,\ y \geq 0$

15. Compute coefficient of variance of the following table:

Marks	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**
No. of students	10	16	30	40	26	18

16. In a partnership between A and B, A invest Rs. 4000 more than B. But at the end of 10 months from the commencement of the year, A withdraws his entire capital. If out of the annual profit of Rs.8700, A receives Rs.3300 more than B, find the capitals of each partner.

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

18. The difference between the true and banker's discount on a certain bill due three months hence is Rs. 5 the rate of interest being 4% p.a. Find,
i. True discount
ii. Banker discount and
iii. Amount of the bill.

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Set B

Group A **[10×2×3=60]**

Attempt all the questions

1. a. If $x - iy = \frac{a - ib}{a + ib}$, prove that $x^2 + y^2 = 1$.

   b. In a market survey of 1000 consumers of tea, it was found that 500 purchased Soktim tea, 400 purchased Tokla tea, and 150 purchased both the brands. How many purchased
   i. Soktim tea only
   ii. Tokla tea only

2. a. How many terms of the series 24+20+16+…… must be taken so that sum may be 72? Explain the double answer.

   b. Insert 5 geometric means between $3\frac{5}{9}$ and $40\frac{1}{2}$.

3. a. Find the number of arrangement that can be made out of the letters of the word 'MISSISSIPPI'.

   b. A man has 15 friends of whom 10 are relatives. In how many ways can he invite 8 guests such that 5 of them may be relatives?

4. a. If $A = \begin{bmatrix} 4 & 2 & -1 \\ 3 & -7 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -3 & 0 \\ -1 & 5 \end{bmatrix}$, find BA and $(BA)^1$.

   b. Find the equation of the locus of a point which moves so that its distance from $(4,\ 3)$ is half the distance from $X - axis$.

5. a. Find the equations of the line joining the point of intersection of the lines $x + 3y + 2 = 0$ and $2x - y - 3 = 0$ to the origin.

   b. Evaluate: $\lim_{x \to \infty} \frac{\sqrt{3x^2 + 4x + 5}}{2x - 1}$

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

$$f(x) = \begin{cases} \frac{x^2 - 3x}{x - 3} & x \neq 3 \\ K & x = 3 \end{cases}$$

   Find the value of K so that the function $f(x)$ is continuous at $x = 3$.

   b. Find $\frac{dy}{dx}$ if $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

7. a. Find the derivation of $\frac{e^{4x}}{1 + e^x}$.

   b. Determine whether function is increasing or decreasing or stationary at the specified point:
   $f(x) = x^3 - 4x^2 + 5$ at $x = 1,\ x = 4$ and $x = 8/3$

8. 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 production is Rs. 18,000. Find the cost function. Also calculate the average cost function.

   b. Integrate: $\int (2x + 3)\ e^{x^2 + 3x + 5}\ dx$

9. a. Evaluate: $\int_0^1 \frac{4x}{e^{2x}}\,dx$

b. Determine Q.D. and Coefficient of Q.D. from the following data:

X:	10	12	15	18	20	22
F:	6	14	20	16	8	6

10. a. Rs.72.50 is paid in rupee, mohar and suki in the ratio of 3:5:7. How many of each were there.

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

Group B **[8×5=40]**

11. Prove that $\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(x+y+z)$

12. Find, from the first principle, the derivative of $x+\sqrt{x+1}$.

13. Find the minimum average cost if the cost function is given by $C = 36Q - 10Q^2 + 2Q^3$. Find also the marginal cost at which average cost is minimum.

14. Solve the following *LP* problems graphically, Maximize $Z = 5x + 2y$. Subject to constraints

$2x + y \le 4$

$x - 2y \le 2$

$x \ge 0,$

$y \ge 0$

15. *A* and *B* appeared in five examinations. Following are the marks obtained by them in five examinations out of the total score 100.

Marks of A	45	60	65	70	80
Marks of B	30	70	80	85	90

Who is more consistent of performance?

16. *A* and *B* invests £10,000 and £12,000 as a capital in a business. *A* is only working partner and is paid for both supervision and the capital and *B* is paid for the capital only and out of a total profit £1440, they receive profits in the ratio of 4:3. How much is allowed to *A* for supervision.

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* and the value of remitting the amount by sights draft is *0.240 Bhat* for *Re.1*. Which is the cheaper method and how does the merchant gain by adopting the cheaper method?

18. The difference between the true and banker's discount on a certain bill due six months hence is *Rs.10*, the rate of interest being 2%p.a. Find

i. True discount
ii. Banker's discount and
iii. Amount of the bill.