BUSINESS MATHEMATICS

(Three hours)

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Answer **Question 1** from *Part I* and **six** questions from *Part II, choosing either (i) or (ii) from each question.*
All working ,including rough work, should be done on the same sheet as, and adjacent to, the rest of the answer.
The intended marks for questions or parts of questio0ns are given in brackets [ ]

Mathematical tables and square paper are provided.
Slide rule, may be used.

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PART I
Answer **all** questions

Answer all questions

Question : 1

i) Evaluate $\tan^{-1}\dfrac{1}{2} + \tan^{-1}\dfrac{1}{3}$ [2]

ii) If $y = \gamma = \chi^{\chi}$, find $\dfrac{dy}{dx}$ [2]

iii) Evaluate $\displaystyle\int\left(\dfrac{x^5 + x^2}{x^4}\right)dx$ [2]

iv) Miss Dechen buys a dozen eggs of which 2 turn out to be bad. She chooses 4 eggs to scramble for breakfast. Find the chance that she chooses 3 good   and 1 bad. [2]

v) If the list price of a commodity is Nu. 800, find the net price of the commodity after having discounted successively by 20% and 10%. [2]

vi) How many different words, each containing 2 vowels and 3 consonants can be formed with 5 vowels and 17 consonants? [3]

vii) Find the term independent of x in the expansion of $\left(\dfrac{3}{2}x2 - \dfrac{1}{3x}\right)^9$ [3]

viii) Evaluate by using L−Hospital's rule

$$\lim_{x \to 0} \frac{3\sin x - 3x - x^3}{x^2}$$ [3]

ix) If y = cos (logx), find $\dfrac{d^2y}{dx^2}$ [3]

x) Find the equation of the parabola whose focus is (2,3) and directrix is
x-4y + 3 = 0 [3]

xi) The arithmetic mean of the marks scored by Dorji Tshering, Sangay Tenzin
and Dechen Dolkar are in the series 50, 48 and 12 respectively. The
standard deviation of their mark are 15, 12 and 2 respectively. Who is the
most consistent of the three ? [3]

xii) Two dice are thrown. Find the probability of getting an odd number on
the first dice and a multiple of 3 on the other. [3]

xiii) Solve using Cramer's rule [3]

$7x + 2y - 25 = 0$; $2x - y - 4 = 0$

xiv) The T.D and B.G on a certain bill of exchange due after a certain time are
respectively Rs. 800 and Rs. 25. Find the face value of the bill. [3]

xv) The average due date of 4 bills was 10th June. Three of the bills were
payable as follows : [3]

Nu. 418 on 29th April
Nu. 551 on 3rd June
Nu. 1007 on 8th July

The 4th bill was for Nu. 323.
On what date was it due ?

PART – II (60 marks)

Answer either (i) or (ii) from each question

Question : 2 (i)

a)   In how many ways can letters of the word KHALING be arranged, so that
        the vowels are always together ?   [3]

b)   Find the cube root of 1001 correct to four places of decimals.   [4]

c)   Compute A^{-1} for the matrix, $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & ^-1 & 3 \\ 3 & 2 & ^-1 \end{bmatrix}$ [5]

OR

Question : 2 (ii)

a)   If $A = \begin{bmatrix} 1 & ^-2 \\ 3 & 4 \end{bmatrix}$, show that A (adj A) = |A| x I   [3]

b)   Using properties of determinants, prove that

$$\begin{vmatrix} a-b-c & 2b & 2c \\ 2a & b-c-a & 2c \\ 2a & 2b & c-a-b \end{vmatrix} = (a+b+c)^3$$ [4]

c)   Find the number of combinations of four letters taken from the word
        "EXAMINATION"   [5]

Question : 3 (i)

Prove that : $Cot^{-1} \dfrac{pq+1}{p-q} + Cot^{-1} \dfrac{qr+1}{q-r} + Cot^{-1} \dfrac{rp+1}{r-p} = 0$

[3]

OR

Question : 3 (ii)

Prove that $\text{Sin}^{-1}\sqrt{\dfrac{3}{2}} + 2\tan^{-1}\dfrac{1}{\sqrt{3}} = \dfrac{2\pi}{3}$ [3]

Question : 4 (i)

a)   Evaluate the following integral as limit of sums.

$\displaystyle\int_{1}^{2} x \; dx$ [3]

b)   Find the dimensions of the rectangle of area 81 sq.cm whose perimeter is the least. Find also its perimeter. [4]

c)   Solve : $\dfrac{dy}{dx} + y.\cot x = 1$ [4]

d)   Find the area of the region common to the curves $y^2 = 2x$ and $x^2 = 2y$. If the common region is rotated through four right angles about the x-axis, calculate the volume of the solid of revolution so formed.[5]

OR

Question : 4 (ii)

a)   Integrate : $\displaystyle\int \dfrac{x-2}{(x-3)(x-4)}dx$

[3]

b)   Verify Rolle's theorem for the following function.

$f(x) = e^x \cos x, x \; E\left[\dfrac{-\pi}{2}, \; \dfrac{\pi}{2} \right]$

[4]

c)   Solve : $(2x + y)\, dy = (x-2y)\, dx$

[4]

d)   Find the radius of the closed right circular cylindrical can which encloses a given volume of 100 cm3 and has the minimum surface area. [5]

Question : 5 (i)

a)   Find the equation of the ellipse whose foci are (4,0) and (¯4,0) and the
        eccentricity is $\frac{1}{3}$.   [3]

b)   Find the foci and the length of latus rectum of the hyperbola $9x^2 - 16y^2 =$
        144.   [2]

<div align="center">OR</div>

Question : 5 (ii)

a)   If the parabola $y^2 = 4ax$ passes through the point (3, ¯2), find the coordinates of
        the focus and the equation of directrix.   [3]

b)   Taking the axes of a hyperbola as coordinate axes, find the equation of a
        hyperbola whose transverse and conjugate axes are respectively 10 and 8.   [2]

Question : 6 (i)

a)   Equations of two regression lives are $4x + 3y + 7 = 0$ and $3x + 4y + 8 = 0$.
        Find both the regression coefficients.   [3]

b)   Find Karl Pearson's coefficient of correlation between X and Y from the
        following data :   [5]

X	:	17	19	22	21	23	27	28	16
Y	:	23	26	24	27	26	31	34	15

c)   Taking 1975 as the base year, calculate an index number for 1979, based on
        weighted average of price relatives derived from the table given below.   [4]

Commodities	A	B	C	D
Weight	30	15	25	30
Price per unit in 1975	20	10	5	40
Price per unit in 1979	24	20	30	40

<div align="center">OR</div>

Question : 6 (ii)

a)   Calculate five yearly moving averages of number of students studying in a commercial college from the following figures :   [3]

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
No. of students	332	317	357	392	402	405	410	427	405	438

b)   The marks obtained by the students in Geography & in Economics are as follows :

Marks in Geography	35	10	47	17	10	10	9	6	28
Marks in Economics	30	33	45	8	8	49	12	4	31

Calculate spearman's coefficient of rank correlation.   [5]

c)   A problem in Accounts is given to 3 students A, B & C. their chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. What is the probability that the problem will be solved ?   [4]

Question : 7 (i)

a)   A ship worth Nu. 20,00,000 is wrecked $\frac{1}{5}th$ belonged to A, $\frac{1}{4}th$ belonged to B and the rest to C. Find what loss each of them sustain if the ship is insured to the extent of $\frac{4}{5}th$ its value   [3]

b)   A limited company intends to create a depreciation fund to replace at the end of the 20th year assets costing Rs, 2,00,000. Calculate the amount to be retained out of profits every year if the interest rate is 3%.   [4]

c)   A bill of exchange drawn on 5-3-2005 at 5 months was discounted on 27-6-2005. If the banker's discount at 3% be Rs. 603.60, find the face value of the bill and also B.G.

                                                                                                              [5]

OR

Question : 7 (ii)

a)   A sum of Nu. 3524 is borrowed from a money lender at 6% per annum compounded annually. If this amount is to be paid back in 4 equal annual installments, find the annual installments.   [3]

b)   A firm produces x units of output at a total cost of Nu. $300x - 10x^2 + \frac{1}{3}x^3$

Find the out put at which the marginal cost and the average cost attain their respective minima.   [4]

c)   A building is insurred for $\frac{3}{4}th$ of it's value of Nu. 1,00,000 at 6% premium plus policy tax $\frac{1}{2}\%$. In an accidental fire, 70% of the building is fully destroyed and the remaining portion is reduced to 20% of its value. Find the total premium and the claim amount.   [5]

Graph to be inserted

Backside of the graph