END TERM EXAMINATION

FIRST SEMESTER [BBA] FEBRUARY 2023

Paper Code: BBA103   *Subject: Business Mathematics*
BBA(CAM)103

Time: 3 Hours   *Maximum Marks: 75*

Note: Attempt five questions in all including Q.No.1 which is compulsory.

Q1   Answer **any five** from the following: **[5×5=25]**

a) Find the 20th term of an A.P. with first term 5 and common difference 4.

b) Prove that, for all natural numbers n,
$$1.2 + 2.3 + 3.4 + \ldots\ldots\ldots + n(n+1) = \left[\frac{n(n+1)(n+2)}{3}\right]$$

c) If $x^y = e^{x-y}$, show that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$

d) If Prove: $\frac{1000}{98}C = \frac{999}{97}C + \frac{x}{90}C$, Find the value of x.

e) Find the number of distinct permutations of the letters of the word MATHEMATICS

f) Find the rank of the matrix A, where $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ -1 & -3 & -4 & 3 \end{bmatrix}$ by transforming it into row – echelon form.

g) Define Consumer and Producer Surplus.

Q2 a) Two industries input – output relationship is given below in A with final demand (in units):   **(7.5)**

Producing Industry	Input to Industry		Final Demand
	I	II	
I	50	75	75
II	100	50	50

If the gross output to increases to $\begin{matrix} I \\ II \end{matrix}\begin{pmatrix} 400 \\ 600 \end{pmatrix}$, determine the final demand which can be satisfied. Also test the Hawkins – Simon conditions.

P.T.O.

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b) A salesman has the following record of sales during three months for three items A, B and C which have different rates of commission

Months	Sales of Units			Total Commission drawn (in Rs.)
	A	B	C	
January	90	100	20	800
February	130	50	40	900
March	60	100	30	850

Find out the rates of commission on items A, B and C.   **(5)**

Q3 The total cost function of a firm is $C(x) = \frac{1}{3}x^3 + 3x^2 - 7x + 16$, where x is the output. Determine   **(12.5)**

i. The Average Cost
ii. The Marginal Average Cost and Marginal Cost
iii. The rate of change of MC with respect to x
iv. Show that the Marginal average cost = $\frac{x MC(x) - C(x)}{x^2}$

Q4 a) Evaluate the following: **(9)**

i) $\int \frac{1}{x \log x(\log \log x)} dx$

ii) $\int x^2(1+x)\log(xe^x) dx$

iii) $\int \frac{x^{3\log x}-1}{x^{\log x}+1} dx$

b) $\int_0^1 \frac{1+2x-2x^2x^3}{x^2-x^3+x+2} dx$ **(3.5)**

Q5 a) If p times the pth term of an A.P. is equal to q times the qth term of the A.P., show that the (p+q)th term is zero.   **(4)**

b) Find the number of numbers less than 1000 and divisible by 5, which can be formed with the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9, no digit being repeated in any number.   **(4)**

c) In a multinational firm, 4 posts fall vacant and 35 candidates apply for the posts. In How many ways, can the selection be made, if   **(4.5)**
i) a particular candidate is always excluded?
ii) a particular candidate is always included?

P.T.O.

Q6 A multiproduct firm produces two commodities X_1 and X_2 whose prices per unit are 12 and 18 respectively. Assuming the firm's cost function as
$$C = 2x_1^2 + x_1 x_2 + 2x_2^2$$
Obtain the optimum levels of its products which maximize profit   **[12.5]**

Q7 a) Find the consumer's surplus and producers' surplus under pure competition for demand function $x = \frac{\beta}{p+\lambda} - \beta$ and supply function $p = 5 + x$, where p is price and x are quantity   **(8)**

b) The marginal cost and marginal revenue functions of a product are given by $MC = 20 + \frac{x}{20}$ and $MR = 30$. The fixed cost is 200. Determine the maximum profit and the profit maximizing level output   **(4.5)**

Q8 a) A company charges Rs. 6000 for a television set on orders of 50 or less sets. The charge is reduced on every set by Rs. 75 per set for each set ordered in excess of 50. Find the largest size order the company should allow to receive a maximum revenue   **(5)**

b) A student has 4 places where he can eat lunch. The college canteen charges Rs. 8 for a Dosa, Rs. 3 for French fries and Rs. 5 for a soft drink. The campus coffee house charges Rs. 10 for a Dosa, Rs. 2 for French fries and Rs. 4.50 for a soft drink. A fast-food place charges Rs. 8 for a Dosa, Rs. 4 for French fries and Rs. 5 for a soft drink. A nearby restaurant serves Rs. 12 for a Dosa, Rs. 5 for French fries and a free soft drink for any order **(7.5)**

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