Code : 302204

BBA 2nd Semester Exam., 2022

BUSINESS MATHEMATICS AND STATISTICS—1

(Mathematical Economics)

Time : 3 hours   *Full Marks* : 60

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **SEVEN** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question Nos. **1** and **2** are compulsory.*

(v) Notations if any are of usual meaning.

1. Choose the correct answer (any *six*) :   2×6=12

   (a) If A and B are two sets such that $n(A) = 15$, $n(B) = 21$, and $n(A \cup B) = 36$, then $n(A \cap B)$ equals to

       (i) 2

       (ii) 0

       (iii) 4

       (iv) 15

   (b) If $A = \{1, 2, 3\}$ and $B = \{4, 5, 6\}$, then $n(A)$ is equals to

       (i) 6

       (ii) 9

       (iii) 27

       (iv) None of the above

   (c) The smallest set A such that $A \cup \{4, 5\} = \{1, 2, 3, 4, 5\}$ is

       (i) $\{3, 4, 5\}$

       (ii) $\{1, 2, 3\}$

       (iii) $\{1, 2\}$

       (iv) $\{1, 2, 3, 4, 5\}$

   (d) The polynomial equation $x(x + 1) + 8 = (x + 2)(x - 2)$ is

       (i) linear equation

       (ii) quadratic equation

       (iii) cubic equation

       (iv) bi-quadratic equation

(e) The equation $(x-2)^2 + 1 = 2x - 3$ is a

  (i) linear equation

  (ii) quadratic equation

  (iii) cubic equation

  (iv) bi-quadratic equation

(f) The quadratic equation whose roots are 1 and $-\dfrac{1}{2}$ is

  (i) $2x^2 + x - 1 = 0$

  (ii) $2x^2 - x - 1 = 0$

  (iii) $2x^2 + x + 1 = 0$

  (iv) $2x^2 - x + 1 = 0$

(g) There are 30 people in a group. If all shake hands with one another, how many handshakes are possible?

  (i) 870

  (ii) 435

  (iii) 30!

  (iv) 29! + 1

(h) Evaluate the integral of $dx/(x+2)$ from -6 to -10.

  (i) $21/2$

  (ii) $1/2$

  (iii) In 3

  (iv) In 2

(i) What is the derivative with respect to x of $(x+1)^3 - x^3$?

  (i) $3x + 6$

  (ii) $3x - 3$

  (iii) $6x - 3$

  (iv) $6x + 3$

(j) If A is any square matrix, then which of the following is skew-symmetric?

  (i) $A + A^T$

  (ii) $A - A^T$

  (iii) AA^T

  (iv) $A^T A$

2. Answer any *three* of the following questions :

$4 \times 3 = 12$

(a) Find the 6th term in the expansion of $\left(2x^2 - \frac{1}{3}x^2\right)^{10}$.

(b) Find the number of permutations of all the letters of the word 'MATHEMATICS' which starts with consonants only.

(c) If the sum of the coefficients of all even powers of x in the product

$(1 + x + x^2 + \cdots + x^{2n})(1 - x + x^2 - x^3 + \cdots + x^{2n})$

is 61, then find the value of n.

(d) How many words can be formed out of the letter 'ARTICLE' so that the vowels occupy the even places?

(e) Define adjoint of a matrix.

Answer any *three* of the following questions :

$12 \times 3 = 36$

3. (a) Evaluate the limit : 4

$\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$

(b) Evaluate the limit : 4

$M = \lim_{x \to 2} \frac{x^2 - 4}{x - 2}$

(e) Evaluate the limit : 4

$\lim_{x \to 4} x^2 + 3x - 4$

4. (a) If $A = \begin{pmatrix} 2 & 3 & 0 \\ 4 & 3 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & 7 \\ 6 & 4 \end{pmatrix}$, then find AB and BA. 4

(b) Write the following system of linear equations in matrix form : 4

$2x + 4y - 3z = 24$

$6x - 10y + 4z = 52$

$-2x + 6y + 4z = 68$

(c) A system of linear equations is presented below in matrix form. Write the corresponding equation system : 4

$AX = B \begin{pmatrix} 1 & 4 & -3 \\ 6 & -10 & 4 \\ -2 & 6 & 0 \end{pmatrix} \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 24 \\ 52 \\ 40 \end{pmatrix}$

5. (a) Find the derivative of the following : $4 \times 2 = 8$

(i) $f(x) = (\cos x)^x$

(ii) $f(x) = (5 + 3x)^5$

(b) Integrate $\cos x \, dx$ under the lower and upper limit 0 and π. 4

6. (a) Using matrix inversion, solve the following system of linear equations : 6

$$2x + y = 10$$
$$x + y = 7$$

(b) Find the inverse of the following matrix : 6

$$A = \begin{pmatrix} 4 & 2 \\ 1 & 1 \end{pmatrix}$$

7. Find the inverse of the following matrix : 12

$$A = \begin{pmatrix} 4 & 2 & 2 \\ 2 & 3 & 1 \\ 2 & 1 & 0 \end{pmatrix}$$

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