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CARMEL COLLEGE OF ARTS SCIENCE AND COMMERCE FOR WOMEN
NUVEM-GOA

SEMESTER END EXAMINATION JANUARY 2022

Semester: I **Course name and code: Commercial Arithmetic- I (CAC 101)**
Total marks: 80 **Date:** **Duration: 2 hrs** **Total number of pages: 3**

Instructions: i) All questions are compulsory.
ii) Figures to the right indicate full marks.
iii) Use of non programmable calculators is allowed.

I) Answer any four of the following questions. (4x4=16)

- 1) Write the following sets in their Set-builder form
 - i. $\{9, 16, 25, 36, 49\}$
 - ii. $\{3, 6, 9, 12, 15, \dots\}$
- 2) Obtain the power set of $\{5, 6, 7, 8\}$.
- 3) If $X = \{1, 2, 3, 4, \dots, 25\}$ is the universal set, $A = \{3, 5, 6, 7, 8, 12, 13, 14\}$,
 $B = \{3, 5, 7, 9, 11, 13, 15\}$ and $C = \{11, 13, 20, 22, 24\}$, find
 - i. $(A \cup B) - (A \cap B)$
 - ii. $(A \cup B)' - C$
- 4) Compute 7P_3 and ${}^{11}C_7$.
- 5) In how many ways can we arrange the letters of the word QUESTION such that the word starts with the letter E?
- 6) Find the 12th term of the G.P. whose first term is 12 and the common ratio is 2.

II) Answer any four of the following questions. (4x4=16)

- 1) Construct a truth table for the statement $(p \Leftrightarrow q) \wedge (\sim q)$
- 2) Classify the following as A.P, G.P or neither
 - i. $1, 3, 5, 7, 9, \dots$
 - ii. $2, 4, 8, 12, 14, \dots$
 - iii. $1, 7, 13, 20, 27, \dots$
- 3) Find x if $\begin{vmatrix} 1 & x-1 \\ 2 & 4 \end{vmatrix} = 0$
- 4) Compute $\begin{vmatrix} 1 & 2 & 2 \\ 1 & 4 & 4 \\ 1 & 4 & 3 \end{vmatrix}$
- 5) In how many years will the simple interest on a principal of Rs. 15,000 be Rs. 1500 at the rate of 10% per annum?
- 6) Find the amount if Rs. 10,000 is invested at 10% per annum for 2 years when compounded annually.

III) Answer either A and B or X and Y (6x2=12)

- A. Sheela is repaying her debt in 8 monthly installments which form a G.P. If her third installment is Rs. 100 and the sixth installment is Rs. 12,500, find her first installment and the total amount repaid by her in the entire period of 8 months.
- B. From 4 professors and 6 students a committee of 3 is to be formed. In how many ways can this be done if the committee contains
- At most one professor
 - At least 2 professors

OR

- X. If for an A.P. the 6th term is 40 and the 13th term is 26, find the first term and the common difference. Also find the sum of its first 8 terms.
- Y. How many different 4-digit numbers can be formed using the digits 0, 2, 3, 6, 8 and 9 such that
- no digit is repeated
 - repetition is allowed
 - the number starts and ends with 3 (repetition of digits is allowed)

IV) Answer either A and B or X and Y (6 x 2 = 12)

- A. In a class of 75 students, 40 students play cricket, 35 students play hockey, 30 students play football, 15 students play both cricket and hockey, 10 play both hockey and football, 12 play both cricket and football and 4 play all three games. Find the number of students who play
- at least one of the three games
 - exactly 2 of the three games
 - exactly one game
- B. How many different words can be formed with the letters of the word "FORMAT"? In how many of these O and A are together? How many of these begin with O and end with A?

OR

- X. Saitama invested Rs. 35 in January 2000. If he doubles his investment every month, find his total investment at the end of the year 2000.
- Y. Kakashi received Rs. 8240 as maturity amount at the end of 2 years of his annuity, the period of payment being at the end of each year. Find the size of his yearly installments if the rate of interest was 6% compounded on a yearly basis.

V) Answer either A and B or X and Y

(6 x 2 = 12)

A. Check whether the following statements are equivalent.

$$p \Rightarrow (q \Rightarrow p); \sim p \Rightarrow (p \Rightarrow q)$$

B. Solve the following system of equations using Cramer's rule

$$2x + y - z = 1$$

$$3x + 2y + z = 3$$

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

OR

X. Test the validity of the following argument

If the spell is not interrupted, then reality won't be compromised.

Reality is compromised.

Therefore, the spell was interrupted.

Y. Check whether $AB = BA$ where

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 3 \\ 4 & 5 & 5 \end{bmatrix} \text{ and } B = \begin{bmatrix} 3 & 6 & 9 \\ 4 & 3 & 1 \\ 2 & 2 & 2 \end{bmatrix}$$

VI) Answer either A and B or X and Y

(6 x 2 = 12)

A. If $A = \begin{bmatrix} 1 & -1 \\ -3 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 2 \\ 0 & -1 & -3 \end{bmatrix}$ find AB and BA if they exist.

B. If $A = \begin{bmatrix} 2 & -4 \\ 0 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -7 \\ 2 & 1 \end{bmatrix}$, find the matrix X such that $3X + A - 2B = 0$

OR

X. Find the amount of an ordinary annuity with periodic payment as Rs. 3000, at the rate of 10% p.a., for 2 years when the period of payment is

- i. yearly
- ii. half-yearly
- iii. monthly

Y. Find the compound interest on Rs. 2500 at 8% per annum for 4 years if the interest is calculated

- i. yearly
- ii. half-yearly
- iii. quarterly
