

**MES COLLEGE OF ARTS & COMMERCE, ZUARINAGAR - GOA**  
**B.Com.(CBCS) I Semester End (Regular/Repeat) Examination, January 2022**  
**CC 4 – COMMERCIAL ARITHMETIC–I (UCAC101)**

*Instructions : i) All questions are compulsory, however internal choice is available.*  
*ii) Figures against every question indicate marks allotted.*

**Duration: 02 Hours**

**Max. Marks : 80**

**Q I) Answer the following:**

**(5 × 4 = 20)**

a) Prove that the following statement is a Tautology:

$$(q \vee \sim q) \vee (p \wedge q)$$

b) Find the Simple Interest on Rs. 8000 invested for 8 years at 9% p. a. rate of interest.

c) How many different arrangements can be made using each letter of the word "**BOTTLE**"?

d) Find  $t_{16}$  and  $t_{21}$  for the following **Arithmetic Progression (AP)**:

$$20, 40, 60, 80, 100, \dots$$

e) If A and B are two matrices given by  $A = \begin{bmatrix} 1 & 1 \\ 3 & 8 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ 8 & 10 \end{bmatrix}$ , then find  $20A + 5B$ .

**OR**

**Q I) Answer the following:**

**(5 × 4 = 20)**

p) Check the validity of the following argument:

$$p \rightarrow q, \sim p \vdash \sim q$$

q) Find the effective rate of interest equivalent to the nominal rate of 8% p. a. when compounded semi – annually.

r) How many different arrangements can be made using each letter of the word "**VOWELS**" which begin with V and end with S?

s) If for a **Geometric Progression (GP)**,  $a = 1$  and  $r = 2$ , then find  $S_9$ .

t) If C and D are two matrices given by  $C = \begin{bmatrix} 1 & 2 \\ 9 & 1 \end{bmatrix}$  and  $D = \begin{bmatrix} 1 & 8 & 1 \\ 8 & 1 & 8 \end{bmatrix}$ , then find CD and  $D^T$ .

**Q II) Answer the following:**

**(5 × 4 = 20)**

- a) Construct the truth table for the following statement:  
 $(p \vee q) \wedge (p \rightarrow q)$
- b) If  $X = \{8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 100\}$  is the Universal set,  $A = \{8, 16, 80, 88, 96\}$  and  $B = \{8, 24, 56, 96\}$  are 2 sets, then find  $A \cup B$ ,  $A \cap B$ ,  $A - B$  and  $A'$ .
- c) Find what Principal will yield Rs. 25600 as Simple interest in 8 years at 10% p.a. rate of interest.
- d) How many 3 digit numbers can be formed using the digits 1, 2, 3 and 4 which are divisible by 2? (Repetition of digits is allowed)
- e) Find  $S_{100}$  for the following **Arithmetic Progression(AP)**:  
2, 4, 6, 8, 10, ...

**OR**

**Q II) Answer the following:**

**(5 × 4 = 20)**

- p) check if the following statements are logically equivalent:  
 $p \leftrightarrow q$  and  $\sim p \vee \sim q$
- q) If  $X = \{10, 20, 30, 40, 50, 60, 70, 80, 90, 100\}$  is the Universal set,  $A = \{10, 20, 90, 100\}$  and  $B = \{30, 40, 50, 100\}$  are 2 sets, then verify if  $(A \cup B)' = A' \cap B'$ .
- r) Priya has taken a loan of Rs. 8000 which is to be repaid in 4 monthly installments. If the interest rate is 4% p. a. compounded monthly, then find the value of each EMI to be paid by Priya using Reducing Balance Method.
- s) Find  ${}^9C_6 + {}^9C_5$ .
- t) Find  $t_8$  and  $t_9$  for the following **Geometric Progression(GP)**:  
20, 40, 80, 160, ...

**Q III) Answer the following:**

**(5 × 4 = 20)**

- a) Find the future value of Rs. 1000 after 4 years if compound interest rate is 9% p.a. compounded annually.
- b) Solve the following equations using Cramer's Rule:  
 $13x + 2y = 15$  and  $7x + 2y = 9$
- c) In a survey of families, it was found that 500 can speak English, 400 can speak Hindi and 100 can speak both English and Hindi. Find the number of families that can speak either English or Hindi.

d) If for an **Arithmetic Progression (AP)**,  $t_{21} = 96$  and  $t_{11} = 56$ , then find a and d.

e) i) Find the value of  ${}^{10}P_4$ .

ii) Find the value of  $8!$

OR

**Q III) Answer the following:**

**(5 × 4 = 20)**

p) Find the present value of an annuity of Rs.8000 payable at the end of each year for 2 years at 9% p.a. compounded annually.

q) i) If  $\begin{bmatrix} 4x+3 & 100 \\ 5 & 4 \end{bmatrix} = \begin{bmatrix} 23 & 100 \\ 5 & 4 \end{bmatrix}$ , then find the value of x.

ii) If  $A = \begin{bmatrix} 4 & 5 & 8 \\ 8 & 16 & 24 \\ 3 & 6 & 9 \end{bmatrix}$ , then find  $C_{13}$ .

r) If X is the Universal set given by  $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$ ,

$A = \{1, 8\}$  and  $B = \{x | x \in X, x^2 - 3x + 2 = 0\}$  are two sets, then check if  $A = B$ .

s) If for a **Geometric Progression (GP)**,  $a = 16$  and  $t_4 = 128$ , then find r and  $t_2$ .

t) In how many ways can 3 Yellow and 5 Pink balls be arranged in a straight line so that the balls of the same colour always appear together?

**Q IV) Answer the following:**

**(5 × 4 = 20)**

a) Rohit obtained a loan Rs. 100000 at 20% p.a. flat rate of interest to be paid back in monthly installments over a period of 8 years. What is the value of each **EMI** to be paid by him?

b) A class consists of 20 girls and 10 boys. In how many ways can 3 students be selected from this class, so as to include exactly 2 girls and 1 boy?

c) Siya invests Rs. 100 on the first day and increases her daily investment by Rs. 32 every succeeding day. Find the total investment done by her at the end of 20<sup>th</sup> day.

d) Find the compound interest on Rs. 2800 invested for 4 years at 20% p.a. rate of interest compounded annually.

e) Check if the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 6 & 1 \\ 1 & 2 & 3 \end{bmatrix}$  is Singular.

OR

**Q IV) Answer the following:**

**(5 × 4 = 20)**

p) Find the future value of the following ordinary annuity:

Rs. 8000 invested per year for 2 years at 9% p.a. compounded annually

- q) In how many ways can 4 books be selected from a bookshelf containing 6 books?
- r) If the investment done by a person on a daily basis forms a Geometric Progression such that amount invested on 2<sup>nd</sup> day is Rs. 16 and the amount invested on 5<sup>th</sup> day is Rs. 1024, then find the value of investment done by him on the first day.
- s) Find the present value of Rs. 1116 required 4 years from now if compound interest rate is 10% per annum compounded annually.
- t) In a stationary shop there 20 notebooks, 16 erasers and 8 pens. Selling price of each notebook is Rs. 40, eraser is Rs. 5 and pen is Rs. 8. How much amount the store owner will receive after selling all these items? Solve the problem using matrix multiplication.

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