Time: 2 hours   Maximum Marks: 80

INSTRUCTIONS:

1. All questions are compulsory (internal choice is provided).

2. Figures to the right indicate full marks.

3. Non Programmable Calculator are allowed.

Q.1 Attempt the following: [5X4]

(a) Check whether the statement is contradiction : $\sim p \vee (p \wedge q)$.

(b) Find the sum borrowed by Rohit from a bank on compound interest of 5% pa, to be calculated annually, if he had to pay back ₹26,460 after 2 years.

(c) In how many ways can be letters of the word MATHEMATICS be arranged?

(d) For an arithmetic progression with $a_{10} = 16$, find S_{19}.

(e) If $A = \begin{bmatrix} 5 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 0 & 4 \end{bmatrix}$, find $A + 3B + 5I$, where I is identity matrix.

OR

Q. I Attempt the following: [5X4]

(v) Construct the truth table for $[p \wedge (p \implies q)] \implies q$.

(w) If ₹2000 amounts to ₹2700 at simple interest in 5 years, find the rate of interest. Also find, if a sum of ₹6000 is kept at the same rate of interest, what will be the amount received after 8 years?

(x) In how many ways a committee of 5 members can be selected from 6 men and 5 women, such that at least 4 women is to be included?

(y) Find an A.P. whose 10th term is 5 and 18th term is 77.

(z) Find x if $\begin{vmatrix} 2x + 3 & -1 \\ -3x + 3 & 4 \end{vmatrix} = 0$

Q.2 Attempt the following: [5X4]

(a) Arjit deposited ₹10,000 at the end of each year for 10 years in a bank. The bank pays interest at 7% pa compounded semi-annually, what would be the sum to his credit at the end of that period.

(b) If $A \cup B = \{a, b, c, d\}$, $A \cap B = \{b, c\}$, $A \cup C = \{a, b, c, f\}$ and $A \cap C = \{a, b\}$, Then find A, B and C.

(c) Find the three numbers in G.P such that sum of first and second number is 16 and their product is 1728.

(d) Solve using determinants

$4x - 3y = 17; \ 5x + y = 7.$

(e) If $^nP_r = 504 \ ^nC_r = 84$. find n and r.

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

Q. II Attempt the following: [5×

(v) A person has taken a loan of ₹60,000 to be returned in 4 monthly installments at the rate of 10% pa compounded monthly. Find the EMI using the reducing balance method.

(w) If U={a,e,i,o,u} be the universal set, $A = \{a, e, i\}$, $B = \{e, o, u\}$ $C = \{a, i, u\}$, then verify $A \cap (B - C) = (A \cap B) - (A \cap C)$.

(x) A sum of ₹72,800 is to be repaid in 6 monthly installments, such that each installment is three times the previous installment. Find the first and the last installments.

(y) If $A = \begin{bmatrix} 1 & -1 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find the value of a and b.

(z) If $^nC_7 = ^n C_3$, find $^{21}C_n$.

Q.3 Attempt the following: [5×

(a) A housing society having 12 members wants to collect a sinking fund of ₹1,66,680 for repairs within a period of 3 years. If the rate of interest is 15% pa to be compounded yearly, how much yearly payment each member has to make towards the fund , so as to meet the requirements.

(b) In a class of 60 students. 25 students play cricket and 20 students plays tennis and 10 students play both the games. Find the number of students who play neither.

(c) Test the validity of the following argument:
Mohan will watch movie if and only if it is played in Inox. The movie is played in Inox therefore Mohan will watch the movie.

(d) In how many ways can the letters of the word ' CONSTANT ' be arranged, so that the two vowels are always together?

(e) Find the sum of the first 200 numbers of the series: $3, 6, 9, \ldots.$

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

. Q. III Attempt the following: [5

(v) Find the present value of an investment of ₹2000 due in 6 years if money is worth 5% pa compounded semi-annually.

(w) If A= letter of the word " SUCCESS"; B= letter of the word "STORIES". verify (i) $A \cup B = (A - B) \cup B$.

(x) State the converse, inverse and contrapositive of the following conditional statements:
If Virat is the captain then we will win the match.

(y) In how many ways can a committee of 5 be chosen from 10 candidates so as to include both the youngest and oldest.

(z)

Q.4 Attempt the following: [5X4]

(a) The difference between simple and compound interest on a sum of money put out for 3 years at 20% pa is ₹1600. Find the sum.

(b) Find $|A|$, if $A = \begin{bmatrix} 2 & 5 & 1 \\ -3 & 0 & 2 \\ 0 & 2 & -1 \end{bmatrix}$.

(c) Find the number of terms in the geometric progression $6, 12, 24, \ldots, 1536$.

(d) Find the present value of an annuity of ₹2000, paid at the end of each year for 4 years, at 11% pa compounded half yearly.

(e) How many 4-digit numbers can be formed with the digits 1,2,5,6,7. How many of them are divisible by 5.

OR

Q. IV Attempt the following: [5X4]

(v) In what time would a sum of money triple itself at simple interest of 8% pa?

(w) Find the inverse of the matrix $A = \begin{bmatrix} 3 & -5 \\ 4 & 3 \end{bmatrix}$.

(x) Find three numbers in A.P. whose sum is 15 and the product is 45.

(y) Find the effective rate of interest when the interest is compounded at 10% pa payable quarterly.

(z) In an examination paper on Mathematics 6 questions are set. In how many different ways can you choose 4 questions to answer? If however, question number 1 is made compulsory, in how many ways can you select to answer 4 questions in all.