Progressive Education Society's

Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16 (Autonomous)

End Semester Examination: Oct. / Nov. 2024

***Total No. of Questions**: 3 / 16* ***Total No. of Pages**: 2*

FIRST YEAR (Data Science)
24-DSC 11103: Fundamentals of Mathematics
(Semester I)

Program: BSc (BSc DS10) **Credits:** 2
Program Specific: BSc(Data Science) **Time:** 2 Hours
Course Type: Major **Max. Marks:** 30
Paper: II **SET: A**

Instructions to the candidate:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw a well labelled diagram wherever necessary.*

Q.1) Attempt ANY FIVE of the following: **$5 \times 2 = 10$**

1) Determine all subsets of the set X = {1, 2, 3}.Also find Cardinality of power set of X.

2) For the two sets A = {1, 2, 3, 4} and B = {1, 5}, Find A – B, B – A.

3) Find first four terms of the recurrence relation $a_n = a_{n-1} + 2$ with the initial condition $a_0 = 1$.

4) Define a relation R from a set A to set B where A = {1, 2, 3, 4} and B = {1, 4, 6, 9} such that

aRb if and only if a|b.

5) State the counting principle of Addition.

6) Convert the following proposition into symbolic form. Also find its converse.

"If food is good, then rating will be 3 stars"

7) Among 100 students, 55 students got distinction in first year, 30 got distinction in second year, and 15 got distinction in both years. Then how many students got distinction in at least one year?

Q.2) Attempt ANY THREE of the following: **$3 \times 4 = 12$**

1) Find Greatest Common Divisor of 45 and 33 by using Euclid's Algorithm. Also find integers x and y such that GCD(45,33) = 45x + 33y.

2) In how many ways can the letters in the following words can be arranged?

i) COMPUTER ii) MATHEMATICS

3) Check the validity of the following argument by using direct method.

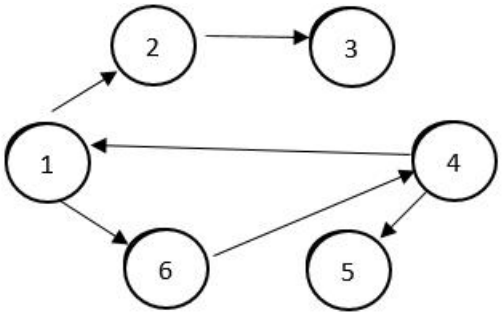
$$a \rightarrow \sim b, b, \sim c \rightarrow a \dashv c$$

4) By using the following digraph, Find

i) a path of length 2 from vertex 3.

ii) a cycle from vertex 6.

iii) all paths of length 1.



5) Let R = {(1, a), (1, b), (2, b), (2, c), (3, b)} and S={(1, b), (2, c), (3, b)} be the relations from set A={1, 2, 3} to Set B= {a, b, c}.

Compute i) R ∪ S ii) R ∩ S iii)R^{-1} iv) $\overline{R}$.

Q.3) Attempt ANY TWO of the following: **2 × 4 = 8**

1) i) Write the recurrence relation for the sequence 1, 2, 4, 8, . . .

ii) Solve the recurrence relation $a_r - 7a_{r-1} + 12\ a_{r-2} = 0$.

2) Define Equivalence relation. For the set X= {1, 2, 3, 4}, Construct the following relations on X:

i) Relation which is Reflexive and Symmetric

ii) Relation which is Reflexive and Transitive.

3) Determine whether the following proposition is tautology, contradiction or contingency.

(p ∧ q) ∧ (p → q)

4) Consider a relation R = {(1, 1), (1, 2), (2, 3), (3, 1), (3, 2)} on the set A = {1, 2, 3}. Find transitive closure of the relation R using Warshall's algorithm.