Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
Even Semester Examination: April 2023-2024
Faculty: Science and Technology

Program: BScGen03 **Semester: IV** **Set : B**
Program (Specific):B.Sc. **Course Type: Core**
Class: S.Y.B.Sc(Regular) **Max. Marks: 35**
Name of the Course: Discrete Mathematics **Course Code: 23-MT-242 B**
Paper no.: II **Time: 2Hrs**

Instructions to the candidate:

1) ***There are 3 sections in the question paper. Write each section on separate page.***
2) ***All Sections are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labelled diagram wherever necessary.***
5) ***Symbols have their usual meaning.***

SECTION: A

Q.1) Solve any 5 of the following. **(Marks 10)**

a) Using the statements p: Raj is obedient , q : Raj is intelligent, convert the following statement to symbolic form hence write its negation. "Raj is obedient and intelligent ".

b) How many 5 digit numbers can be formed from the digits 1, 2, 3, 4 and 5 with repetition allowed?

c) Define Homogenous recurrence relation with an example.

d) Determine if the following proposition is tautology or not?

$$[(p \vee q) \wedge \neg p] \rightarrow q$$

e) How many different arrangement of 6 different Chemistry books, 4 different Biology books and 3 different Mathematics books are possible if the books of each subject must be all together ?

f) Find a_2 and a_3 if $a_n = 3a_{n-1} + 4a_{n-2}$, $n \geq 2$ with initial conditions $a_0 = 1$, $a_1 = 1$.

g) Write the following argument in symbolic form.
" Either Hari attends the lecture or he watches the movie. If hari attends the lecture, he will have a cup of coffee. If he watches the movie, he will go to hotel. Therefore he will either have a cup of coffee or he will go to hotel."

SECTION : B

Q.2) Solve any 3 of the following. (Marks 15)

a) Test the validity of the following argument by direct method.
$p \to r, \quad \neg r , \; p \vee q \quad \vdash q$.

b) Show that if any six numbers from the set S = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} are chosen , then two of the numbers will add up to 11.

c) Solve the recurrence relation $a_r + 4 a_{r-1} + 4 a_{r-2} = 0$, with $a_1 = 1$, $a_0 = 0$.

d) Check whether the following propositions are tautology or contradiction.
   i. $(p \wedge q) \wedge (p \vee q)$,
   ii. $p \vee \neg (p \wedge q)$.

e) Write the truth values of the following predicates if U = {1, 2, 3, 4, 5 }.
   i. $\exists x , x^2 - 3x + 2 = 0$.
   ii. $\forall x , x^2 \geq 9$.
   iii. ∀ x, x is a prime number.
   iv. ∃ x, x is an even number.
   v. ∃ x , x is a perfect square.

SECTION : C

Q.3) Solve any 1 of the following. (Marks 10)

a) Find the number of integers from 1 to 1000 that are divisible by 2 or 3 or 5 .

b) i) Find the coefficient of $x^{13} y^{17}$ in the expansion of $(2x + 3y)^{30}$.
   ii) If the homogenous solution of the recurrence relation $a_r - 4 a_{r-2} = 3r$ is $a_r^{(h)} = C_0 (2)^r + C_1 (-2)^r$, then find the particular solution $a_r^{(p)}$.

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