Roll No. | 2 | 7 | 9 | 2 | 1 | 6 | 4 |

End Semester Examination 2024

Name of the Program: BCA *Semester: II*

Name of the Course: BCA *Course Code:* TBC -204

Paper Name: Discrete Mathematics

Time: 3:00 Hours

MM: 100

Note:

(i) Answer **all the questions** by choosing ***any two of the sub questions.***

(ii) Each question contains three parts a, b & c. Attempt any two part of choice from each question.

Q.1	**(20 Marks)**	CO1
a)	A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girls ? (ii) at least one boy and one girl ? (iii) at least 3 girls ?	
b)	How many words with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated, if. (i) 4 letters are used at a time (ii) All letters are used at a time	
c)	If ${}^{n}P_{r} = 240$ and ${}^{n}C_{r} = 120$, then find the value of n and r.	
Q.2	**(20 Marks)**	CO2
a)	Show that (i) $(p \to q) \wedge (q \to p) \equiv (p \vee q) \to (p \wedge q)$ (ii) $(p \wedge \neg q) \to r \equiv p \to (q \vee r)$	
b)	Define the following: (i) Quantifiers (ii) Logical equivalence (iii) Tautologies.	
c)	Consider the following argument and determine whether it is valid or not. Either I will get good marks or I will not graduate. If I did not graduate I will go to Australia. I get good marks. Thus I would not go to Australia.	
Q.3	**(20 Marks)**	CO3
a)	Define the following with examples (i) Euclidean algorithm (ii) Division algorithm (iii) Properties of Integers.	
b)	(i) Find the gcd of 595 and 252. And express it in the form $252x + 595y$.	
c)	Using Principle of Mathematical induction proves that $3^{2n+2} - 8n - 9$ is divisible by 8.	

Q.4	**(10 Marks)**	CO4
a)	Show that the relation $R: Z \to Z$ defined as $R = \{(a,b) : (a-b) \text{ is divisible by } 5 \ \forall a,b \in Z\}$ is an equivalence relation.	
b)	Let $f: R \to R$ and $g: R \to R$ are two functions defined as $f(x) = \sin x$ *and* $g(x) = x^3$ then find fof, fog, gof, gog.	
c)	Define the following with example: (i) Floor and Ceiling function (ii) Invertible function (iii) Characteristic function.	
Q.5	**(20 Marks)**	CO5
a)	In a class of 42 students, each play at least one of the three games: Cricket, Hockey and Football. It is found that 14 play Cricket, 20 play Hockey and 24 play Football, 3 play both Cricket and Football, 2 play both Hockey and Football and none play all the three games. Find the number of students who play Cricket but not Hockey	
b)	Define the following: (i) Rook Polynomial (ii) Pigeon hole Principle (iii) Inclusion and exclusion principle.	
c)	In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students were taking neither tea nor coffee.	