RAJARSHI JANAK UNIVERSITY
OFFICE OF THE CENTRAL EXAMINATION
End Semester Examination - 2022

Bachelor of Computer Application
Course Title: Discrete Structure — **Full Marks: 60**
Course Code: HCAC- 255 — **Pass Marks: 24**
Year/Semester: Second/IV — **Time: 3 hours**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

[Group B]

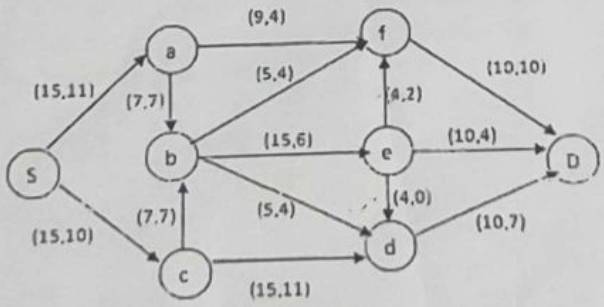
Short Answer Questions (Attempt any Six): **[6x5=30]**

11. Show that (P V Q) Λ (Γ P Λ Γ Q) is a contradiction.
12. Explain four rules of inference for quantified statements.
13. Find gcd (421, 111) using Euclidean algorithm.
14. If R and S be relations on A = {1,2,3,4} defined by R={(1,1), (1,2), (3,4), (4,2)} and S={(1,1), (2,1), (3,1), (4,4), (2,2)}. Find SoR and RoS.
15. Suppose that a connected planar simple graph has 20 vertices, each of degree 4. Into how many regions does a representation of this planar graph split the plane?
16. What is a tree traversal? Write traversal algorithm for pre-order, in-order and post-order traversal.
17. What are the properties of algebraic system? Write the algebra properties.

[Group C]

Long Answer Questions (Attempt any Two): **[2x10=20]**

18. Using rules of inferences, show that the hypotheses "If you send me an e-mail message, then I will finish writing the program," "If you do not send me an e-mail message, then I will go to sleep early," and "If I go to sleep early, then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed." You are required to show each steps and give reasons for those steps before you come to the desired conclusion.
19. Define Euler circuit and Hamilton circuit. Find the minimum cut and maximal flow for the given network graph:



20. Solve the simultaneous congruence x ≡ 6 (mod 11), x ≡ 13 (mod 16), x ≡ 9 (mod 21), x ≡ 19 (mod 25).

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RAJARSHI JANAK UNIVERSITY
OFFICE OF THE CENTRAL EXAMINATION
End Semester Examination, 2021

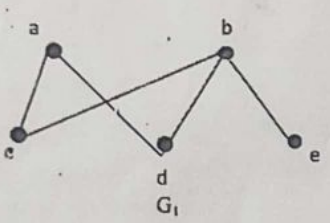
Bachelor of Computer Application
Course Title: Discrete Structure — **Full Marks: 60**
Course Code: BCAC- 255 — **Pass Marks: 24**
Year/Semester: Second/IV — **Time: 3 hours**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

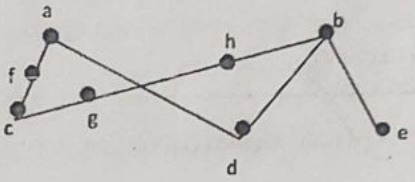
[Group B]

Short questions (any six): **[6x5=30]**

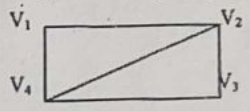
11. Let p and q are two statements. Show that $p \rightarrow q$ and $\neg pVq$ are logically equivalent.
12. Let a and b be two integers. Show that $a \equiv b \pmod m$ iff a mod m= b mod m.
13. Let A={1,2,3}and R= {(1,3),(3,2),(3,1)}. Find the transitive closure of R using warshall's algorithm.
14. Draw the Hasse diagram representing the partial ordering $\{(a,b): a \text{ divides } b\}$ on the set {1,2,3,4,6,8,12}.
15. What do you mean by homeomorphic graphs? Show that the graphs G_1 and G_2 are Homeomorphic.



G_1



16. Find the number of spanning trees of the given graph G. Also, find the Spanning trees



17. Prove that the set of integers is an abelian group under addition

[Group C]

Long questions (any two): **[2x10=20]**

18. Use resolution principle to prove the following argument is correct:
If today is Tuesday, I have a test in Mathematics or Economics. If my Economics professor is sick, I will not have a test in Economics. Today is Tuesday and my Economics professor is sick therefore, I have a test in mathematics.

RAJARSHI JANAK UNIVERSITY
OFFICE OF THE CENTRAL EXAMINATION
End Semester Examination 2020

Bachelor of Science in Computer Science and Information Technology

Course Title: Discrete Mathematics — **Full Marks: 60**

Course Code: SCIT - 203 — **Pass Marks: 24**

Year/Semester: Second/III — **Time: 3 hours**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

[Group A]

Very short answer questions (Attempt any five): **[5x2=10]**

1. What is the principle of inclusion and exclusion?
2. Show that every subgroup of an abelian group is a normal subgroup.
3. The bit strings for the sets A ={1,2,3,4,5} and B = {1,3,5,7,9} are 1111100000 and 1010101010 respectively. Use bit strings to find the union and intersection of these sets.
4. Define prefix code with an example.
5. What is the ordered rooted tree that represents the expression $\frac{x-4}{3}$?
6. Find the number of ways in which 12 students can be allotted to 3 different committees, each having an equal number of students.

[Group B]

Short answer questions (Attempt any six): **[6x5=30]**

7. Define following relations:
   a) Reflexive b) Antisymmetric c) Transitive d) Partial ordering.
8. Let (G,*) be a group and H be a nonempty subset of G. Show that (H, *) is a subgroup if for any a and b in H, $a*b^{-1}$ is also in H.
9. Define walk, path and cycle. Also represent them by graph.
10. Prove that there is one and only one path between every pair of vertices in a tree T.
11. Find the generating function of the numeric function $a_r = 5.2^r$.
12. Construct a truth table for the statements: $(p \vee \sim q) \rightarrow q$.
13. What are the symbolic form and negation of the statements?
    i) There is an honest politician.
    ii) All American eat meat.

[Group C]

Long answer questions (Attempt any two):

[2x10=20]

14. What are the techniques of proof? Discuss any one. Also let A= {1,2,3} and R= {(1,3),(3,2),(3,1)}. Find the transitive closure of R using warshall's algorithm. unit 3
15. Define rooted tree. Obtain the rooted tree with 'a' as the root from the graph G (V, E) where V={a,b,c,d,e,f,g,h,i,j,k,l,m} and
E={(c,d),(b,c),(a,b),(a,g),(g,h),(h,k),(a,l),(c,e),(g,i),(g,j),(j,m),(j,f)}.
Also find (i) level of each vertices (ii) siblings of h (iii) ancestors of e (iv) height of the tree.
16. Show that the hypothesis "It is not sunny this afternoon and it is colder than yesterday". unit 1 "We will go swimming only if it is sunny". "If we do not go swimming, then we will take a canoe trip", and "if we take a canoe trip, then we will be home by sunset" lead to the conclusion "we will be home by sunset". (use resolution-refutation method.)

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RAJARSHI JANAK UNIVERSITY
OFFICE OF THE CENTRAL EXAMINATION
End Semester Examination-2022

Bachelor of Science in Computer Science and Information Technology

Course Title: Discrete Mathematics — **Full Marks: 60**

Course Code: SCIT 203 — **Pass Marks: 24**

Year/Semester: Third/V — **Time: 3 hours**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

[Group A]

Very short questions): **[5x2=10]**

1. What is the principle of inclusion and exclusion?
2. Let G= {1,-1,i, -i} is a group under multiplication them show that H={1,-1} is a subgroup of G.
3. The bit string for the set {1,3,5,7,9} with universal set {1,2,3,4,5,6,7,8,9,10} is 1010101010. What is the bit string for the complement of this set?
4. Define prefix code with an example.
5. If three persons enter a bus in which there are ten vacant seats, Find in how many ways they can seat.

[Group B]

Short questions (any six): **[6x5=30]**

6. Define following relations:
   a) Symmetric b) Partial Ordering c) Equivalence
7. Define walk, path and cycle. Also represent them by graph.
8. Let G= $\left\{\begin{pmatrix} a & b \\ c & d \end{pmatrix} : ad - bc \neq 0\right\}$ be a group under matrix multiplication, then show that H=$\left\{\begin{pmatrix} a & 0 \\ 0 & d \end{pmatrix} : ad \neq 0\right\}$ is a sub-group of G.
9. Prove that there is one and only one path between every pair of vertices in a tree T.
10. Construct a truth table for the compound statement $(p \wedge q) \rightarrow (p \vee q)$ unit-1
11. Find the generating function of the numeric function $a_r = 5.2^r$.
12. What are the symbolic form and negation of the statement?
    i. The summer in Tarai is very hot. ii. Ram drinks coffee in the morning.

[Group C]

Long questions (any two): **[2x10=20]**

13. Define rooted tree. Obtain the rooted tree with 'a' as the root from the graph G(V,E) (1+7)
    whereV={a,b,c,d,e,f,g,h,i,j,k,l,m} and
    E={(c,d),(b,c),(a,b),(a,g),(g,h),(h,k),(a,l),(c,e),(g,i),(g,j),(j,m),(j,f)}
    Also find (i) level of each vertices (ii) siblings of h (iii) ancestors of e (iv) height of the tree.
14. Show that the hypothesis "It is not sunny this afternoon and it is colder than yesterday", "We will go swimming only if it is sunny", "If we do not go swimming, then we will take a canoe trip", and "if we take a canoe trip, then we will be home by sunset" lead to the conclusion "we will be home by sunset". (use resolution-refutation method.) unit-1
15. What are the techniques of proof? Discuss any one. Also let A={1,2,3} and R={(1,3),(3,2),(3,1)} Find the transitive closure of R using warshall's algorithm unit-3

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