PURBANCHAL UNIVERSITY

2014 (New)

B.E.(Computer)/Fourth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG274CO: Discrete Structure

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

Answer TWO questions. 2×12=24

1(a) Define regular graph, complete graph and connected graph. Explain methods to represent graph in a computer.

(b) Explain transport network with an example.

2. What is finite state antomata? Design a deterministic finite automata (DFA) that accepts strings consisting of symbols 0 and 1 and ending with a substring 01.

3. Discuss recurrence relation, homogeneous recurrence relation and Fibonacci sequence.

Group B

Answer SEVEN questions. 7×8=56

4. Suppose that a box contains 15 balls, of which 8 are red and 7 are black. In how many ways can 5 balls be chosen so that:
   (a) all five are red
   (b) all five are black

5. Prove the following statement by mathematical induction

$$1+2+3+\ldots\ldots+n = \frac{n(n+1)}{2}$$

6. What do you mean by diagraph of a relation? Let A = {a, b, c, d} and R = {(a, b), (a, c), (b, a), (b, c), (c, d), (d, a)}.

   Find the transitive closure of R using warshall's algorithm.

7. What do you mean by minimal spanning tree? Using prim's algorithm find the minimal spanning tree for the following graph

Contd. ...

PURBANCHAL UNIVERSITY

2016

B.E.(Computer)/Fourth Semester/ *Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG274CO: Discrete Structure *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions. **8×10=80**

1(a) State pigeonhole principle. 2

(b) In a psychology experiment, the subjects under study were classified according to body type and gender as follows: 3

	Endomorph	Ectomorph	Mesomorph
Male	72	54	36
Female	62	64	38

(i) How many male subjects were there?

(ii) How many subjects were ectomorphs?

(iii) How many subjects were either female or endomorphs?

(c) A bookshelf is to be used to display six new books. Suppose that there are eight computer science books and five French books from which to choose. If we decide to show four computer science books and two French books and we are required to keep the books in each subject together, how many different displays are possible? 5

2(a) Define universal quantifier and existential quantifier. 3

(b) Show that the statement $((p \to q) \wedge (q \leftrightarrow r)) \to (p \to r)$ is tautology. 3

(c) Obtain the principle conjunctive normal from of $(\sim p \to r) \wedge (q \leftrightarrow p)$ 4

3(a) State principle of mathematical induction. Prove by mathematical induction that $1+5+9+.....+(4n-3)=n(2n-1)$ 2+5

Contd. ...

(2)

(b) State the contrapositive, converse and inverse of the following statement.

"If the triangle is equilateral, then it is equiangular". 3

4(a) Discuss types of relation on a set. 3

(b) Let A = {1, 2, 3} and the relation R is given as: 5

R={(1, 1), (1, 2), (1, 3), (2, 2). (2, 3), (3, 3)}. Determine whether the relation R is symmetry, Asymmetry, Anti-symmetry, Transitive or/and Reflexive. Justify your answer. 5

(c) Define domain and range. 2

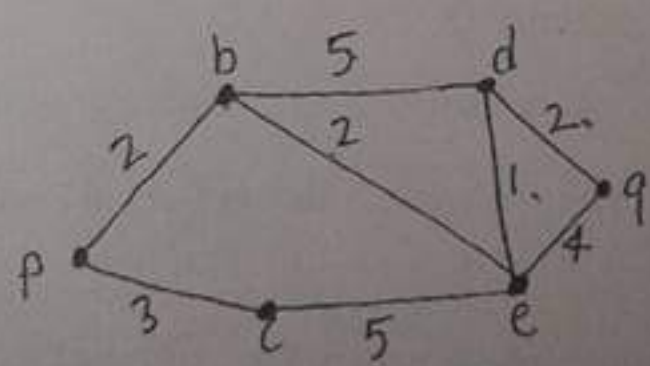
5. Let c_1 and c_2 be real numbers. Suppose that $r^2-c_1r-c_2=0$ has two distinct roots: r_1 and r_2. Show that if $a_n=\alpha_1 r^n_1+\alpha_2 r_2^n$ for n= 0,1,2, ... where α_1 and α_2 are constants, then the sequence $\{a_n\}$ is a solution of the recurrence relation $a_n=c_1a_{n-1}+c_2a_{n-2}$. Also find the solution of the recurrence relation $a_n=6a_{n-1}-11a_{n-2}+6a_{n-3}$. 5+5

6. Express the relation R= {1,1), (1,3), (2,1), (2,3), (2,4), (3,1), (3,2), (4,1)} on the set A={1,2,3,4) as directed graph. Use the Warshall's algorithm to compute transitive closure of R. 3+7

7(a) Define Hamiltonian circuit and path. Give the example of graph which is Hamiltonian circuit. 2+3

(b) Define sub-graph and bipartite graph with example. 5

8(a) Find the length of a shortest path between p and q in the weighted graph given below: 7



(b) Define loop, path and circuit. 3

9(a) Define parsing. Discuss context free grammar and regular grammar. 1+3

(b) Discuss importance of Finite state machine. 3

(c) Write down the regular expressions for following: 3

(i) the set of strings of two 0s, followed by zero or more 1s and ending with a 0.

(ii) the set of strings for three 0s followed by two or more 0s.

(iii) the set of strings of any number of 0s followed by at least one number of 1.

≈

PURBANCHAL UNIVERSITY

2015

B.E.(Computer)/Fourth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG274CO: Discrete Structure *(New Course)*

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

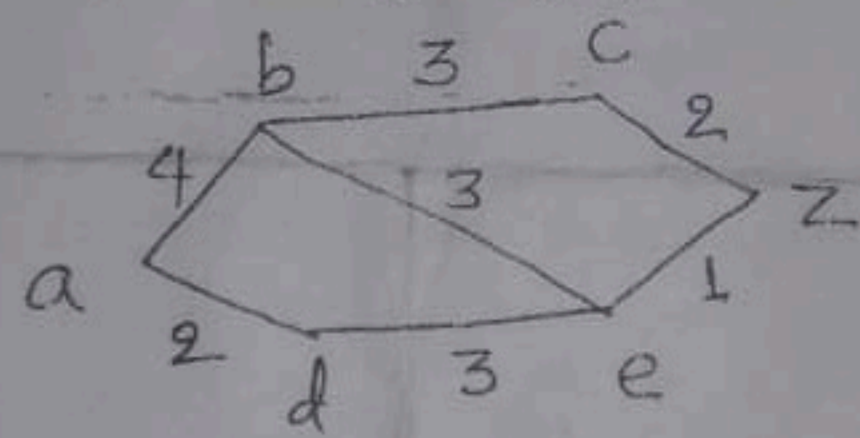
Group A

Answer TWO questions. **2×12=24**

1. What is Logic? What are propositions? Differentiate between Tautology and contradiction. Draw a truth table for $(p \rightarrow q) \wedge (\wedge q \rightarrow \wedge p)$.

2. Define bipartite graph with example. Find the shortest path between a and z in the weighted graph shown below.

$(p \rightarrow q) \wedge (q \rightarrow p)$



3(a) State the definition of regular expression and list the set represented by te expression $(0+1)^*1$.

(b) Define deterministic finite automata. Design a DFA that accepts the set of binary stings which have 101 as substring.

Group B

Answer SEVEN questions. **7×8=56**

4. State the product rule in counting with an example. Find the number of ways to draw 2 red and 4 white balls from a bag containing 10 balls, of which 5 are red and 5 are white, when 6 balls are drawn.

5. Prove the following by the method of induction.

$$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\text{-------}\frac{1}{(n-1)n}=\frac{3}{2}-\frac{1}{n}$$

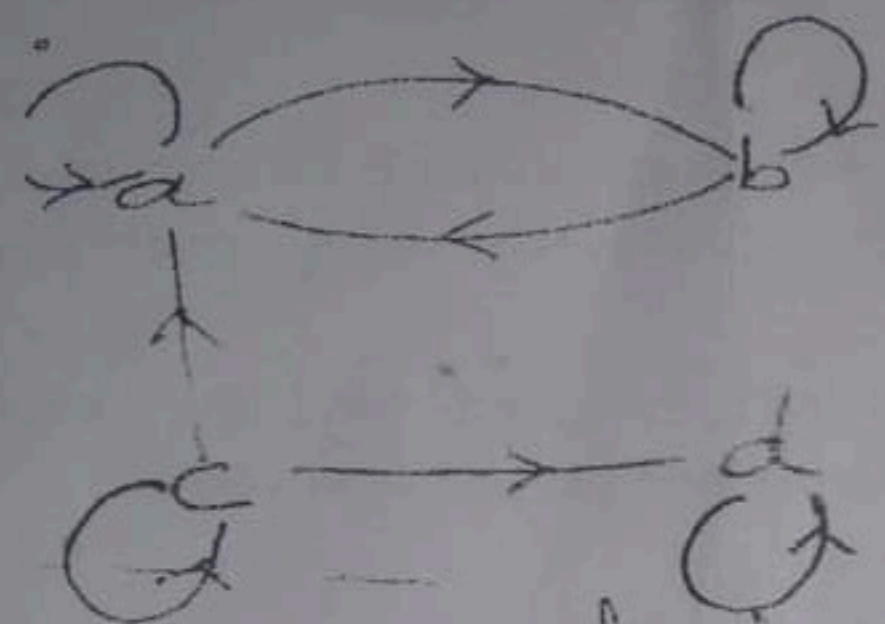
Contd. ...

6. Use warshall's algorithm to find the transitive closure of the relation R= {(1,2), (1,3), (1,4), (2,3), (2,4), (3,4)}.

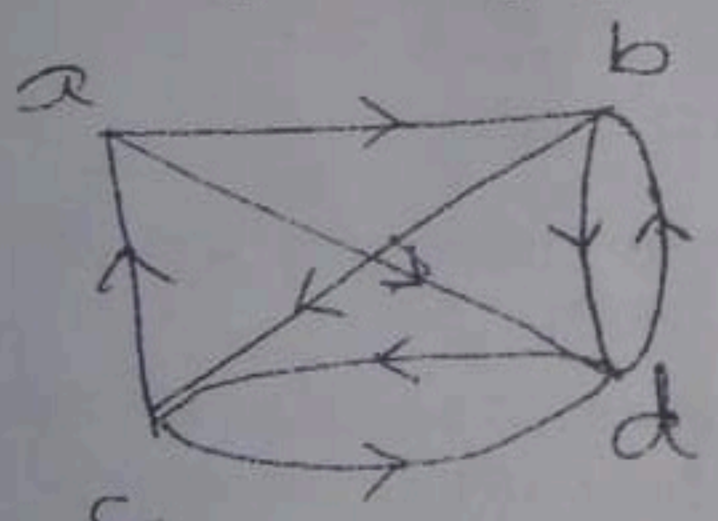
7. Find the explicit formulas for the following recurrence relation.

$$f_n = f_{n-1} + f_{n-2} \text{ if } n>2$$
$$= 0 \text{ if } n=1$$
$$= 1 \text{ if } n=2$$

8. Determine whether relation represented by following di-graph are reflexive, symmetric, antisymmetric, and /or transitive.



9. Define Hamiltonian path and circuit. Determine whether the following directed graph has an euler path and/or euler circuit.



10. Define union, intersection and complement of set.
If A = {x | x is a positive integer <4}
B= {x^2 | x is an integer and $2 \le x \le 5$}, then verify DeMorgan's laws.

11. Write short notes on any TWO:
(a) Adjacency matrix & adjacency list.
(b) Pigeon hole principle
(c) Transport network

Group B:

Answer SEVEN questions. **7×8=56**

4(a) Prove that, if a and b be two positive integers, then GCD(a, b).LCM(a, b) = ab. 4

(b) Compute GCD(273, 98) using the Euclidean algorithm. 4

5. State Pigeonhole principle. Show that if any eight positive integers are chosen, two of them will have the same remainder when divided by 7. 2+6

6. State principle of mathematical induction. Using the principle of mathematical induction prove that $1^2 + 3^2 + 5^2 + \ldots\ldots + (2n-1)^2 = \dfrac{n(2n+1)(2n-1)}{3}$. 2+6

7. Let A = {1, 2, 3, 4} and B = {a, b, c}.

Let R = {(1, a), (1, b), (2, b), (2, c), (3, b), (4, a)} and

S = {(1, a),. (2, c), (3, b), (4, b)}

Compute: (a) $\overline{R}$ (b) $R \cap C$ (c) $R \cup C$ and (d) R^{-1}.

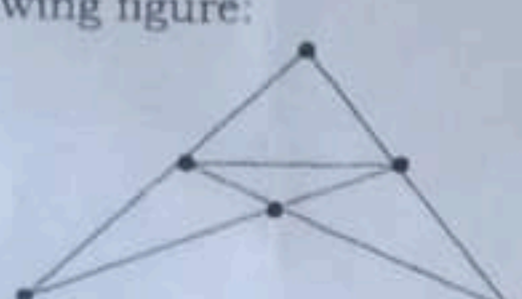
8. Let M be the finite state machine with state table appearing in the table:

	f			g		
S \ A	a	b.	c	a	b	c
s0	s0	sl	s2	0	1	0
s1	s1	s1	s0	1	1	1
s2	s2	s1	s0	1	0	0

Find the input set A, the state set S, the output set 0 and initial state of M. Draw the state diagram of M.

Find the output string for the input string aabbc. 2+3+3

9. Use Fleury's algorithm to construct an Euler circuit for the graph in the following figure:



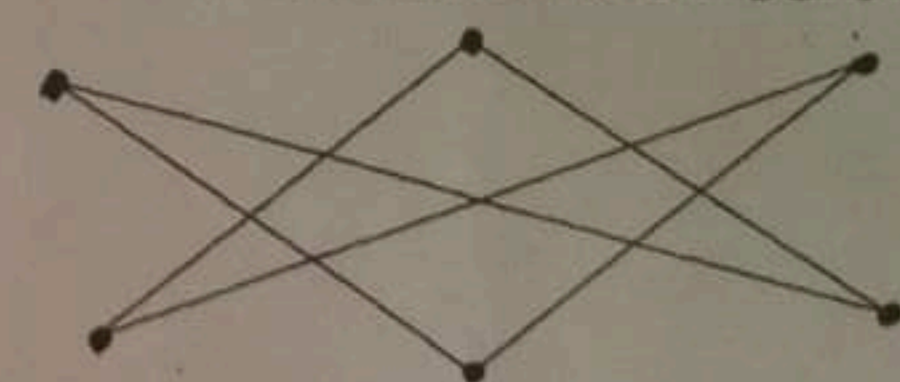
Contd. ...

10. Solve the recurrence relation:
$a_n - 9a_{n-1} + 20a_{n-2} = 0$, $a_0 = -3$, $a_1 = -10$.

11. Use generating function to solve the following: $a_n = 3a_{n-1} + 2$, $a_0 = 1$.

12(a). Compute the truth table of the statement $(p \Rightarrow q) \Leftrightarrow (\sim q \Rightarrow \sim p)$

(b) Find a Hamiltonian circuit for the following graph: 4+4



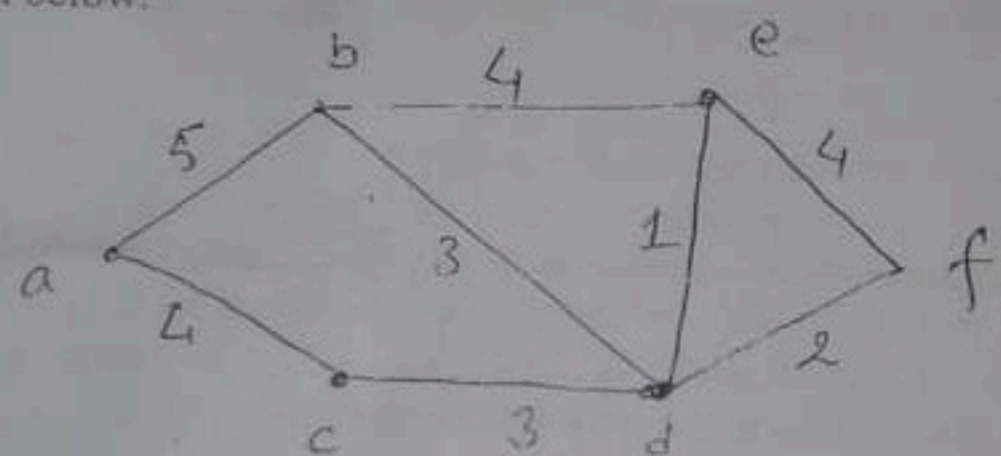
≈

5. What is closure of a relation? Draw the diagraph for the relation ≤ on the set {1, 2, 3, 4}, also find its transitive closure. [8]

6. find all solution for the recurrence relation $a_{n+2}-2a_{n+1}+a_n=2^n$ with initial conditions $a_0=2$ $a_1=1$. [8]

7. Give a recursive algorithm for computing n! where n is a non negative integer. [8]

8. Use Dijkstra's algorithm to find the length of the shortest path between the vertices a and f in the weighted graph given below. [8]



9. What finite state automation ?design a finite state automata that accepts precisely those strings over {a,b} that contains an even number of a's. your design should include the proper definition of the finite state automaton, transition table and the transition diagram. [8]

10. Write short notes on. [8]

(2) a. Hamiltonian Graph
b. in-degree and out-degree of a vertex.
c. saturated flow
d. cut and it's capacity.

THE END

PURBANCHAL UNIVERSITY

OFFICE OF THE EXAMINATION MANAGEMENT

LEVEL-B.E. PROGRAM- COMPUTER

PART /YEAR-II/II F.M.-80 P.M.-32

SUBJECT- DISCRETE STRUCTURE (BEG274CO)

- *Candidates are required to give their answer in their own words as far as practicable.*
- *Attempt all questions*
- *The figure in the margin indicate full marks*
- *Assume suitable data if necessary.*

1. What are the basic rules for counting? State the Pigeonhole principle. Each user on a computer system has a password, which is six to eight characters long, where each character is an uppercase letter or a digit. Each password must contain at least one digit. How many possible passwords are there? [8]

2. Draw the truth table for the derived connectives NOR and XOR. prove that the compound proposition $((p\rightarrow\sim q)\rightarrow r))\rightarrow(p\rightarrow(q\vee r))$ is tautology. where $\sim$ denotes the negation of the proposition, $\vee$ denotes the disjunction and $\rightarrow$ denotes the implication. [8]

3. Use mathematical induction to prove the inequality $n! \geq 2^{n-1}$ for $n\geq 1$. [8]

4. Define equivalence relation. If R be a relation in the set of integers Z defined by $R=\{(x,y): x,y \in Z, (x-y)$ is divisible by $6\}$. Then prove that R is equivalence relation. [8]

(b) Define the closure of a relation. Explain symmetric and transitive closure of a relation. 1+4

5(a) Define recurrence relation. Find the solution of the recurrence relation $a_n=a_{n-1}+2a_{n-2}$ with $a_0=2$ and $a_1=7$. 5

(b) Solve $a_n-4a_{n-1}+4a_{n-2}=2_n$. 5

6(a) Solve the recurrence relation $a_n=2a_{n-1}-a_{n-2}$, $n>=2$ given $a_0=3$, $a_1=-2$ using generating function. 5

(b) Briefly explain the various types of graphs with suitable examples. 5

7(a) Differentiate between Eulerian and Hamiltonian graph with suitable examples. 5

8(a) Define finite state automaton. Construct deterministic finite state automata that recognize the set of bit string that begins with two D's. 2+3

(b) Define grammar and regular expression with examples. 2.5+2.5

9(a) Explain tautology, converse, inverse and biconditional statement with examples. 4

(b) Define disjunctive and conjunctive normal form. Obtain the disjunctive normal form of the form: $\sim(a\rightarrow(b \wedge c))$. 3+3

PURBANCHAL UNIVERSITY

2013

B.E.(Computer)/Fourth Semester/*Final*

Time: 03:00 hrs. Full Marks: 80 /Pass Marks: 32

BEG274CO: Discrete Structure

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer EIGHT questions.

1(a) In a certain programming language, variable should be of length three and should be made up of two letters followed by a digit or of length two made up of a letter followed by a digit. How many variables can be formed? 5

(b) State the Pigeonhole Principle. Find the minimum number of students in a class to be sure that four out of them are born in the same month. 2+3

2(a) List conditions for logical equivalence. Show that $[P \wedge (P \vee Q)] \wedge \sim P$ is a contradiction. 2+3

(b) Define inference. List out the rules of inference for quantified statement. 1+4

3(a) Show the premises "If you send me an e-mail message, then I will finish writing the program".-"If you don't send me an email message, then I will go to sleep early" and "If I go to sleep early, then I will wake up feeling refreshed" will lead to conclusion "If I don't finish writing the program, then I will wake up feeling refreshed". 5

(b) Prove by induction method that $2^{3n}-1$ is divisible by 7. 5

4(a) Define composition of a relation. Consider the following five relations on set $A=\{1, 2, 3, 4\}$

$R_1=\{(1, 1), (1, 2), (2, 3), (1, 3), (4, 4)\}$

$R_2=\{(1, 1), (1, 2), (2, 1), (2, 1), (2, 2), (3, 3), (4, 4)\}$

$R_3=\{(1, 3), (2, 1)\}$

$R_4=\phi$, the empty relation Not reflec

$R_5=A \times A$, the universal relation

Determine which of the relations are reflexive. 2+3

Contd. ...