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BRAINWARE UNIVERSITY

Term End Examination 2023
Programme – BCA-2018
Course Name – Discrete Structures
Course Code - BCA202
(Semester II)

Full Marks : 70 **Time : 3:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) The number of committees of 2 boys and 3 girls that can be formed out of 7 boys and 6 girls is, select the correct option
- a) 21
- b) 20
- c) 420
- d) 50400

(ii) For $A = \{-2, -1, 0, 1, 2\}$ and $f : A \to R, f$ is defined as $f(x) = x^2 + 1$. Then which of the following is true, where $f(A) = \{f(x) : x \in A\}$. Select the correct option
- a) $f(A) = \{5,2,1\}$
- b) $f(A) = \{5,2,10\}$
- c) $f(A) = \{5,8,10\}$
- d) $f(A) = \{7,8,10\}$

(iii) If n pigeon holes are occupied by n+1 pigeons, then at least ______ number of hole is occupied by more than one pigeon., select the correct option
- a) 2
- b) 1
- c) 3
- d) None of these

(iv) If A and B are sets and A∪ B= A ∩ B, then, Write the correct option
- a) A = Φ
- b) B = Φ
- c) A = B
- d) none of these

(v) Let R be a non-empty relation on a collection of sets defined by ARB if and only if A∩ B = ∅, then, write the correct option
- a) R is reflexive and transitive
- b) R is symmetric and not transitive
- c) R is an equivalence relation
- d) R is not reflexive and not symmetric

(vi) Every vertex of a null graph is, Write the correct one
- a) Pendant
- b) Isolated
- c) Odd
- d) None of these

(vii) A vertex whose degree 1 is called, write the correct one
- a) isolated vertex
- b) pendant vertex
- c) even vertex
- d) none of these

(viii) Select the correct one, let p and q be two propositions if truth value of p is F and truth value of q is T then $\backsim p \wedge q$ be

a) T
b) F
c) Both T and F
d) None of these

(ix) Let p: It is sunny afternoon and q: It is hot today, then the symbolic form of the statement 'It is not sunny afternoon and it is not hot today', Identify the correct one

a) $p \vee q$
b) $\neg p \vee q$
c) $\neg p \wedge q$
d) $\neg p \wedge \neg q$

(x) For any positive integer *m*, Select the correct one

a) $gcd(ma, mb) = m$
b) $gcd(ma, mb) = ab$
c) $gcd(ma, mb) = m\, gcd(a, b)$
d) $gcd(ma, mb) = mlcm(a, b)$

(xi) Let p: It is cold and q: It is raining, then the symbolic form of the statement 'It is not raining and it is not cold', Select the correct option

a) $\neg q \wedge p$
b) $\neg q \wedge \neg p$
c) $q \wedge p$
d) None of these

(xii) The function $f : R \to R$ defined by $f(x) = x^4$, where R is the set of all real numbers. Then f is, Select the correct option

a) surjective
b) injective
c) bijective
d) None of these

(xiii) Select the correct one, let p and q be two propositions if truth value of p is T and truth value of q is F then $\backsim p \wedge q$ be

a) T
b) F
c) Both T and F
d) None of these

(xiv) Let p be a proposition 'Anil is rich' and q be a proposition 'Kanchan is poor'. Then the symbolic form of the statement 'Either Anil or Kanchan is rich', Select the correct one

a) $p \vee \neg q$
b) $\neg p \wedge q$
c) $p \wedge q$
d) none of these

(xv) Determine the number of subsets of a set of order four.

a) 3
b) 6
c) 16
d) 9

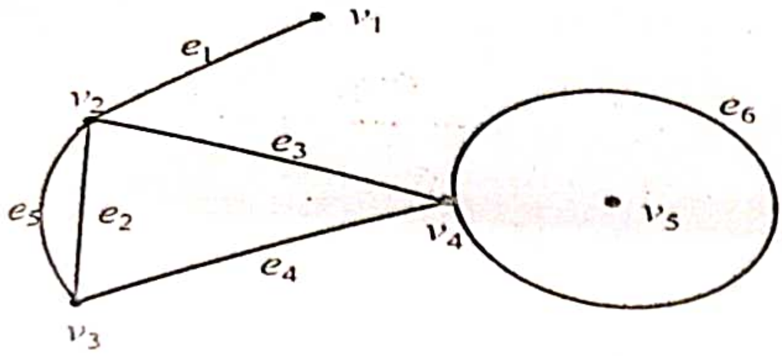
Group-B

(Short Answer Type Questions) 3 x 5=15

2. Examine the following compound proposition is a Tautology (using truth table) $(p \to (q \to p))$ (3)

3. Examine the following compound proposition is a Tautology (using truth table)$((p \to q) \leftrightarrow (\backsim q \to \backsim p))$ (3)

4. Calculate the degree of each vertices from the above Figure (3)



5. Consider the group (Z, +). Let H= {2n: n∈Z}, show that H is a subgroup of Z. (3)

6. Illustrate that the identity elements (if it exists) of any algebraic structure is unique. (3)

OR

Illustrate that the algebraic structure $(N, -)$ where − denotes the binary operation of subtraction on Z , set of natural numbers, is neither associative nor commutative (3)

Group-C

(Long Answer Type Questions) 5 x 8=40

7. Examine whether $(p \wedge q) \rightarrow (p \vee q)$ is a tautology or not (without using truth table) (5)

8. Let p: He is intelligent and q: He is tall be two propositions. State the following statements in symbolic from using p and q: (5)

(i) He is tall but not intelligent.

(ii) He is neither tall nor intelligent.

(iii) He is intelligent or he is tall.

(iv) It is not true that he is intelligent or tall.

(v) It is not true that he is not tall or not intelligent.

9. Illustrate that the function $f: R \rightarrow R$ is a function such that $f(x) = 6x + 5$ is one-one onto (5)

10. Let Q - {1} be the set of all rational numbers except 1 and the operation * on Q-{1}, defined by a*b=a+b-ab for all a, b from Q-{1}, then show that (Q-{1},*) is a group. (5)

11. Let $(G,\circ)$ and $(G',*)$ $be\ two\ groups\ and\ \varphi: G \to G'be\ a\ homomorpism. Then$ (5)

Deduce that: (i) $\varphi(e_G) = e_{G'}$

(ii)$\varphi(a^{-1}) = \{\varphi(a)\}^{-1} for\ all\ a \in G$

(iii)if $a \in G\ and\ o(a)\ is\ finite\ then\ o(\varphi(a))\ is\ a\ divisor\ of\ o(a)$

12. Illustrate that if $A \to B$ is one-one onto, then $f^{-1}: B \to A$ is also one-one onto. (5)

13. Compute the number of non-negative solutions to (5)

$x + y + z = 18\ with\ the\ condition\ x \geq 3,\ y \geq 2\ and\ z \geq 1$

14. Illustrate that (5)

Let $(G,\circ)$ $be\ a\ group. A\ non-$
$empty\ subset\ H\ of\ G\ forms\ a\ subgroup\ of\ (G.\circ)\ iff$

$$a, b \in H \Rightarrow a \circ b^{-1} \in H$$

OR

(i) Illustrate that every cyclic group is an abelian group. (5)

(ii) The set if integer $(Z, +)$ is a cyclic group of which the generator is 1.

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