CONTINUOUS INTERNAL EVALUATION- 1

Dept: CSE	Sem / Div: 3rd A and B	Sub: Discrete Mathematical Structures	S Code: 18CS36
Date: 21/10/2020	Time: 2:30 - 4:00 PM	Max Marks: 50	Elective: N
Note: Answer any 2 full questions, choosing one full question from each part.			

QN		Questions	Marks	RBT	COs
		PART A			
1	a	Prove that for any proposition p, q, r the compound proposition: $\{p \to (q \to r)\} \to \{(p \to q) \to (p \to r)\}$ is a tautology	5	L3	CO1
	b	Prove the following logical equivalence using the laws of logic: $(p \to q) \wedge [\neg q \wedge (r \vee \neg q)] \Leftrightarrow \neg(q \vee p)$	6	L3	CO1
	c	Test the validity of the following argument. If Ravi goes out with friends, he will not study. If Ravi does not study, his father becomes angry. His father is not angry. ∴ Ravi has not gone out with friends.	6	L3	CO1
	d	Let p(x): $x^2 - 7x+10 = 0$, q(x): $x^2 - 2x - 3 = 0$, r(x): $x < 0$. Determine the truth or falsity of the following statements when the universe U contains the integer 2 and 5. If a statement is false, provide a counter example or explanation. i. $\forall x, p(x) \to \neg r(x)$ ii. $\forall x, q(x) \to r(x)$ iii. $\exists x, q(x) \to r(x)$ iv. $\exists x, p(x) \to r(x)$	8	L3	CO1
		OR			
2	a	Prove that, for any three propositions p, q, r, $[p \to (q \wedge r)] \Leftrightarrow [(p \to q) \wedge (p \to r)]$	5	L3	CO1
	b	Verify the principle of duality for the following logical equivalence $[(\neg(p \wedge q) \to \neg p) \vee (\neg p \vee q)] \Leftrightarrow (\neg p \vee q)$.	6	L3	CO1
	c	Test the validity of the following argument. $p \to r$ $r \to s$ $t \vee \neg s$ $\neg t \vee u$ $\neg u$ $\therefore \neg p$	6	L3	CO1
	d	Give (i) a direct proof, (ii) an indirect proof, (iii) proof by contradiction, for the following statements: "If n is an odd integer, then n+9 is an even integer"	8	L3	CO1
		PART B			
3	a	Prove by mathematical induction that: $1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{1}{3} n(2n-1)(2n+1)$	5	L3	CO2
	b	Assuming PASCAL language is case insensitive, an identifier, an identifier consists of a single letter followed by up to seven symbols	6	L3	CO2

CONTINUOUS INTERNAL EVALUATION– 1

		which may be letters or digits (26 letters, 10 digits). There are 36 reserved words. How many distinct identifiers are possible in this version of PASCAL?			
	c	A certain question paper contains three parts A, B, C with four questions in part A, five questions in part B, and six questions in part C. It is required to answer seven questions selecting at least two questions from each part. In how many different ways can a student select his seven questions for answering	6	L3	CO2
	d	i. How many numbers greater than 1000000 can be formed by using digits 1, 2, 2, 2, 4, 4, 5? ii. Find the number of proper divisors of 441000.	8	L3	CO2
		OR			
4	a	Prove by mathematical induction that, for any positive integer n, the number $11^{n+2} + 12^{2n+1}$ is divisible by 133.	5	L3	CO2
	b	Find the coefficients of i. x^9y^3 in the expansion of $(2x-3y)^{12}$ ii. xyz^2 in the expansion of $(2x - y - z)^4$ iii. $a^2b^3c^2d^5$ in the expansion of $(a +2b -3c +2d +5)^{16}$	6	L3	CO2
	c	A committee of 12 is to be selected from 10 men and 10 women. In how many ways can the selection be carries out if, i. There are no restriction ii. There must be six men and six women. iii. There must be an even number of women.	6	L3	CO2
	d	i. How many arrangements are there for all letters in the word SOCIOLOGICAL? In how many of these arrangements a) A and G are adjacent? b) all the vowels are adjacent? ii. How many among the first 100, 000 positive integers contain exactly one 3, one 7 and one 8 in their decimal representations	8	L3	CO2