NSK Section A

SRN | | | | | | | | | | |

PES UNIVERSITY

UE17CS205

End Semester Assessment (ESA) B. Tech. 3rd SEMESTER – Aug-Dec-2018

UE17CS205 - Discrete Mathematics and Logic **Sec A**

Time: 3 Hrs. Answer All Questions Max Marks: 100

1	a	Let p, q, r, s represent the following propositions. p: $x \in \{8, 9, 10, 11, 12\}$ q: x is a composite number r: x is a perfect square s: x is a prime number Find the value of the expression below for each element of the set {8, 9, 10, 11, 12} $\neg((p \rightarrow q) \wedge (\neg r \vee \neg s))$	5
	b	Let p, q be primitive statements for which implication p -> q is false. Determine the truth values of the following. i) $p \wedge q$ ii) $\neg p \vee q$ iii) $q \rightarrow p$ iv) $\neg q \rightarrow \neg p$ v) $\neg q \wedge p$	5
	c	Express precisely using universal and existential quantifiers. x, y, z are integers. I) for a given x, there is a y which is cube of x. ii) for a given x, y we have a z which is x + y. State precisely in English. Iii) $\exists x \forall y (x + y = y)$ Is this valid? If yes, what is the value of x? If no, give a counter example.	2 3
	d	Given x ∈ { santhosh, santasa, ananda } H(x) : x is happy. $\exists x H(x)$. Are these possible? I) santhosh and santasa are both happy. H(santhose) ^ H(ananda) ii) santhosh is definitely happy iii) all santhosh, santasa, ananda are happy iv) dukh is happy v) santasa might be happy	5

SRN

2	a	A and B are sets. i) Given A X B = Φ, what can we conclude about the sets A and B? ii) A X B = B X A. what can we conclude about the sets A and B? iii) A ∩ B = Φ. what can we conclude about the sets A and B? iv) |A| = m; |A x B| = n; what is |B| ? v) |A| = m; |A u B| = n; what is |B| ?	5
	b	Function f : N → N $f(x) = x^2$ State and then prove or disprove whether the function is I) one-to-one ii) onto	4
	c	Classify the following as finite, countably infinite, uncountably infinite. I) set of even numbers ii) set of rational numbers iii) set of real numbers between 0.0 and 1.0 iv) set of prime numbers between 2 and 100	4
	d	A relation R is defined on the set Z by "a R b if a – b is divisible by n" for a, b, n ∈ Z. Prove or disprove that this relationship is an equivalence relationship.	3
	e	R : A → A is a relation on A = {1, 2, 3, 4} R = { (1, 1), (2, 2), (4, 4), (1, 2), (2, 1)} Answer yes or no. i) is this reflexive? ii) is this irreflexive? Iii) Is this transitive? iv) is this symmetric?	4
3	a	Show that if any 14 integers are selected from the set S = { 1, 2, 3, . . . , 25 }, there are at least two whose sum is 26	4
	b	Count the number of palindromes which are less than 1000.	4

	c	`unsigned long int fun(unsigned long int n)`
		`{`
		`    unsigned long int i, j = 0, sum = 0;`
		`    for (i = n; i > 1; i = i/2) j++;`
		`    printf("j : %d\n", j);`
		`    for ( ; j > 1; j = j/2) sum++;`
		`    printf("sum : %d\n", sum);`
		`    return(sum);`
		`}`
		what will be the outputs if the argument passed to this function is 2^{20}.
			4

	d	How many solutions are there to the equation x1 + x2 + x3 + x4 + x5 >= 21 where i) each x is non-negative ii) each x is at least one? Express the solution as a combination.	4

SRN

	e	How many bitstrings of length n a) equal # of 0 and 1 (assume n is even) b) begin with two consecutive 00?	4
4	a	By induction, prove that the max number of leaves in a binary tree is 2^k where k is the level number – level number of the root is 0.	4

	b	Complete this to compare two strings for equality.
		int mycmpstr(int *x, int *y)
		{
		if(________)
		return 1;
		else if(______)
		return 0;
		else
		return what(____, ____);
		}
			4

	c	Solve the recurrence relation I) a(n)=a(n−1)+n with a(0)=4 ii) a(n)=a(n−1) * n with a(0)=4	3 + 3
	d	Express the number of moves in Tower of Hanoi as a recurrence relationship. Solve it.	2 + 4
5	a	Generator for the group is the set {25}. The binary operator is x op y = power(x, y) % 26. I) find all the elements in the group ii) what is the identity? Iii) What is the inverse for each element?	4
	b	Given an algebraic table (results of binary operator on elements of the the underlying set), what do the following indicate? I) all elements on the principal diagonal are same ii) matrix is symmetric iii) all elements in a row are same as the second operand	6
	c	Prove that a group G(T, .) is Abelian iff $(ab)^2 = a^2b^2$ for a, b $\in$ T and . Is the concatenation operator – a.b is written as ab. Prove both if and only if cases.	6
	d	The coding scheme E : $B^m \rightarrow B^{5m.}$ E(10) = 1010101010 while decoding, bit is made 1 if there are 3 or more 1s in the corresponding positions, otherwise 0. Decode the following strings. 101101101101101 101000001100011	4