Hall Ticket Number:

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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CSE: CBCS) III-Semester Supplementary Examinations, May/June-2018

Discrete Structures

Time: 3 hours Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Write *converse, contrapositive and inverse* of the conditional proposition $p \to q$.
2. List out any ***four*** English constructs of biconditional connective $p \leftrightarrow q$.
3. Define an injective function and give an example.
4. Let $f: R \to R$ be given by $f(x) = x^3 - 2$, Find f^{-1}
5. Solve the recurrence relation $F_n=F_{n-1}+F_{n-2}$, where $F_0=0, F_1=1$
6. Write the Generating function that generates sequence 1,4,9,16,25,...........
7. Determine whether each of the following pairs of integers is congruent modulo 9
   i) -137 , 700 ii) -56, -1199.
8. Define "multiplicative inverse" and give an example
9. What is an Hamming Metric ?
10. Define a monoid.

Part-B (5 × 10 = 50 Marks)

11. a) Use substitution rules to verify that each of the following is a tautology.(Here p,q and r are primitive statements). [6]

    a) $[p \vee (q \wedge r)] \vee \neg [p \vee (q \wedge r)]$

    b) $[(p \vee q) \to r] \leftrightarrow [\neg r \to \neg (p \vee q)]$

    Verify Absorption Laws by means of a truth table. [4]

12. a) Draw the Hasse diagram of the following sets under the partial ordering relation "divides," and indicate those which are totally ordered. [6]

    {2,4,8,16} {1,2,3,6,12} {3,5,15}

    b) Let X={1,2,.......7} and R={(x,y) | x-y is divisible by 3}. [4]

    Show that R is an equivalence relation.

13. a) Solve the recurrence relation $a_n-8a_{n-1}+16a_{n-2}=8(5)^n$ where $a_0=12$, $a_1=5$ [5]

    b) In how many ways can two dozen identical robots be assigned to four assembly lines with i)at least three robots assigned to each line ? ii) at least three , but no more than nine robots to each line? [5]

14. a) Let (R,+, .) be a ring with a, b, c, d elements of R. State the conditions(from the definition of a ring) that are needed to prove each of the following results. [5]

    i) (a+b)+c=b+(c+a) ii) c(d+b)+ ab= (a+c)b +cd

    b) *If* $f: R \to S$ is a ring homomorphism and J is an ideal of S , prove that $f^{-1}(J)=\{a \in R \mid f(a) \in J\}$ is an ideal of R [5]

15. a) In a monoid , show that the set of left-invertibles form a sub-monoid. [5]

b) Prove that for any commutative monoid (M, *) , the set of idempotent elements of M forms a submonoid. [5]

16. a) Prove that any Z^+, gcd(5n+3 ,7n+4)=1. [5]

b) Let f:R->R is a function , f(x)=3x-5 where x>0, f(x)=-3x+1 where x<=0, then find f(0), f(5/3), $f^{-1}(-3)$, $f^{-1}(6)$, $f^{-1}([5,-5])$ [5]

17. Answer any *two* of the following:

a) Solve the following recurrence relation [5]

$a_{n+2} + 4a_{n+1} + 4a_n = 7$, $n \geq 0$, $a_0=1$, $a_1=2$.

b) Determine the plain text for the RSA qipher text 1418 1436 2370 1102 1805 0250 if e=11 and n=2501. [5]

c) i) Let p=0.01 be the probability of incorrect transmission for a binary symmetric channel.If the message 1011 is sent via the Hamming (7,4) code, what is the probability of correct decoding? [5]

ii) Answer part (i) for a 20-bit message sent in five blocks of length 4.

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