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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH. DEGREE EXAMINATION, FEBRUARY 2016

Branch: Computer Science and Engineering

Stream: Computer Science and Systems Engineering

04 CS 6401-Discrete Structures For Computer Science

Max Time: 3 Hours   Max. Marks: 60

PART – A (*Answer all questions, Each carrying 03 marks)*

1. Let R be a binary relation defined as $R=\{(a,b)\in R^2 : a-b<3\}$, determine whether R is reflexive, symmetric and transitive.

2. Let A={1,2,3}, B={p,q} and C={a,b}. Let $f: A \rightarrow B$ is f={(1,p),(2,p),(3,a)} and $g: B \rightarrow C$ is given by {(p,b),(q,b)}. Find gof.

3. Prove the following: (i) $p \vee (\neg p \wedge q) \equiv (p \vee q)$ (ii) $p \wedge (\neg p \vee q) \equiv (p \wedge q)$

4. Let p(x):x is mammal and q(x):x is animal. Translate the following in English:

$(\forall x)(q(x) \wedge (\neg p(x)))$

5. How many words of 3 different letters can be formed from the letters of the word COMPUTER

6. What is the coefficient of $x^{12} y^{13}$ in the expansion of $(2x - 3y)^{25}$?

7. Show that (Z_5,,$+_5$) is a cyclic group.

8. Define homomorphism and isomorphism between two algebraic systems.

[08 x 03= 24 Marks]

PART-B
(Answer all, Each carrying 06 marks)

9 in a survey of 260 college students, the following data was obtained: 6
64 took maths course, 94 took computer science, 58 took a business course, 28 took both maths and a business course, 26 took both maths and computer science, 22 took both business and computer science,14 took all three coursees.Use a Venn Diagram to answer the following:
how many students took none of the three courses
how many took at most one course course?
how many students took at least one course

OR

10 Determine whether the relation R on the set of all Web pages is reflexive, symmetric, antisymmetric, and/or transitive, where (a, b) $\in$ R if and only if 6

a) everyone who has visited Web page a has also visited Web page b.
b) there are no common links found on both Web page a and Web page b.
c) there is at least one common link on Web page a and Web page b.
d) there is a Web page that includes links to both Web page a and Web page b.

11 Prove, by mathematical induction, 6

(i) $2n > n^2$ for $n \geqslant 5$

(ii) $11^n - 4^n$ is divisible by 7, for $n \geq 1$

OR

12 Check whether the hypothesis "It is not sunny this afternoon and it is colder than yesterday. We will go swimming only if it is sunny. If we do not go swimming, then we will take a canoe trip. If we take a canoe trip, then we will be home by sunset." lead to the conclusion: We will be home by the sunset. 6

13 A student has three mangos, two papayas, and two kiwi fruits. If the student eats one piece of fruit each day, and only the type of fruit matters, in how many different ways can these fruits be consumed? 6

OR

14 Each user in a computer system has a password which is six to eight character long, each character is an upper case or a digit. Each password must contain at least two digit, How many different passwords are there? 6

15 Suppose that one person in 100,000 has a particular rare disease for which there is a fairly accurate diagnostic test. This test is correct 99.0% of the time when given to a person selected at random who has the disease; it is correct 99.5% of the time when given to a person selected at random who does not have the disease. Given this information can we find 6

(a) the probability that a person who tests positive for the disease has the disease?
(b) the probability that a person who tests negative for the disease does not have the disease?

OR

16 What is the conditional probability that a family with two children has two boys, given they have at least one boy? Assume that each of the possibilities BB, BG, GB, and GG is equally likely, where B represents a boy and G represents a girl. (Note that BG represents a family with an older boy and a younger girl while GB represents a family with an older girl and a younger boy). 6

17 Show that $G = \{1, -1, i, -i\}$ where $i = \sqrt{-i}$ is an abelian group with respect to multiplication as a binary operation. 6

OR

18 What do you mean by group isomorphism. Give example 6

19 Prove that a Ring is commutative if and only if $(a+b)^2 = a^2 + 2ab + b^2$ for $a, b \in R$ 6

OR

20 Find $[a]^{-1}$ in Z_{1009} for (a) a=17 (b) a=100 and (c) a=777 6

[06 x 06 = 36 Marks]