

2020

COMPUTER SCIENCE — HONOURS

Paper : CC-6

Full Marks : 50

The figures in the margin indicate full marks.

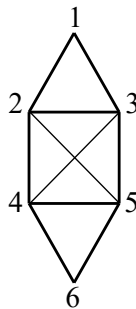
*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **question no. 1** and **any four** from the rest.

1. Answer **any five** questions : 2×5
- (a) When is a relation said to be an equivalence relation? Explain briefly.
 - (b) Show that $f(n) = n^2 + 2n + 1$ is of $O(n^2)$.
 - (c) What is the probability that when two dice are rolled, the sum of the numbers on the two dice is 7?
 - (d) What do you mean by planar graph? Give example.
 - (e) State the drawback of Simpson's $1/3$ rd rule for solving a definite integral.
 - (f) Suppose there are two simple graphs G_1 and G_2 . How do you verify whether G_1 and G_2 are isomorphic?
 - (g) A discrete mathematics class contains 25 students majoring in computer science, 13 students majoring in mathematics and 8 students jointly majoring in both mathematics and computer science. How many students are in this class if every student is majoring in mathematics, computer science, or both mathematics and computer science?
 - (h) State the Bayes' theorem on conditional probability.
2. (a) Give the formal definition of a function, its domain and range. Illustrate with proper examples a one-to-one and a onto function.
- (b) What is the Cartesian product of $A \times B \times C$, where $A = \{0, 1\}$, $B = \{1, 2\}$ and $C = \{0, 1, 2\}$?
- (c) Say there are 10 people namely P_1, P_2, \dots, P_{10} .
- (i) In how many ways can the people be lined up in a row?
 - (ii) How many line-ups are there if P_2, P_6 and P_9 want to stand together (in any order)?
 - (iii) How many line-ups are there in which P_2, P_6 and P_9 do not stand together? Give proper explanation. (2+1+1)+1+(1+2+2)
3. (a) State the Principle of Inclusion and Exclusion for n number of sets.
- (b) How many bit strings of length 8 either start with a 1 bit or end with the two bits 00?
- (c) Among how many students in a class, at least two of them have first names that begin with the same letter? 3+4+3

Please Turn Over

4. (a) Suppose six married people are standing in a room. Two people are chosen at random. Find the probability p that :
- (i) they are married (ii) one is male and one is female.
- (b) When is a trial said to be a Bernoulli trial?
- (c) A fair coin is tossed 6 times, if a head falls it is a success. Find the probability that
- (i) exactly 2 heads occur, (ii) at least 4 heads occur, (iii) at least 1 head occurs. (2+2)+1+(1+2+2)
5. (a) Prove that for a random variable x , $\text{Var}(x) = E(x^2) - \mu^2$, where μ (mu) is the mean value of the population.
- (b) Define the big oh notation. What does it estimate?
- (c) Find the Generating Function for the finite sequence 1, 4, 16, 64, 256. 5+(2+1)+2
6. (a) Define a recurrence relation. Give a suitable example.
- (b) What is the solution of the recurrence relation together with the initial conditions $a_n = 4a_{n-1} - 4a_{n-2}$ for $n \geq 2$, $a_0 = 6$, $a_1 = 8$? (2+3)+5
7. (a) Write an algorithm for finding the area under a curve using Simpson's $1/3$ rd rule.
- (b) Find the smallest positive root of the following equation $f(x) = x^3 - 3x^2 + x + 1 = 0$ using Secant method. 5+5
8. (a) "Every path is an open-walk but every open walk is not a path"— Justify your answer with a suitable example.
- (b) Find the adjacency matrix for the graph in the figure given below. Show all the steps.



- (c) Find the Euler cycle for the above graph. 3+2+5
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