Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech. Winter 2018 - 19 Examination

Semester: 1 **Date: 10/12/2018**
Subject Code: 203202101 **Time: 10:30am to 1:00pm**
Subject Name: Mathematical Foundations of Computer Science **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1(A) A die is thrown, find the probability of the following events: **(05)**
1. A prime number will appear
2. A number greater than or equal to 3 will appear
3. A number less than or equal to one will appear
4. A number more than 6 will appear
5. A number less than 6 will appear

B) Consider the Markov chain with three states, S={1,2,3}, that has the following transition matrix **(05)**

$$P = \begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

Draw the state transition diagram for this chain.

C) Solve the following **(05)**

1. Determine the constant c so that the following p.m.f. of the random variable Y is a valid probability mass function:

$$f(y) = c(1/4)^y \text{ for } y = 1, 2, 3, \ldots$$

2. For a given pmf as

$$P_Y(y) = \begin{cases} (1-p)^{y-1}p & for\ y = 1,2,3,\ldots \\ 0 & otherwise \end{cases}$$

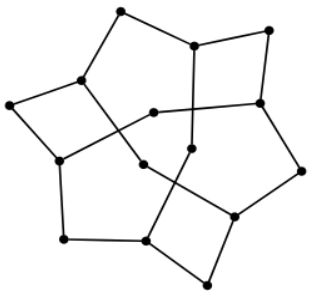
If p = ½, Calculate P(2 <= Y < 5).

Q.2 **Answer the following questions**. (Attempt any three) (Each five mark) **(15)**

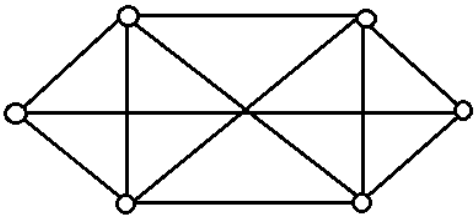
A) How many numbers are there between 100 and 1000 such that at least one of their digits is 6?

B) State whether the following graphs are planar or not.

1.



2.



C) A group consists of equal number of men and women. From this group, 20% men and 50% women unemployed. If a person is selected at random from this group. The probability of selected being employed is ?

D) ${}^{2n+1}_{n-1}P : {}^{2n-1}_{n}P = 3:5$. Find n.

Q.3 (A) On the roulette wheel, X=1 with probability 18/38 and X= -1 with probability 20/38. **(07)**

1. Find mean (Expectation)
2. Calculate Variance

B) You are performing a cohort study. If the probability of developing disease in the exposed group is .05 for the study duration, then if you (randomly) sample 500 exposed people, how many do you expect to develop the disease? Give a margin of error (+/- 1 standard deviation) for your estimate. (Consider the study to have binomial distribution) **(08)**

OR

B) If I toss a coin 20 times, what's the probability of getting of getting 2 or fewer heads? **(08)**

Q.4 **(07)**

A) Explain vertex coloring in Graphs. Show how vertex coloring can solve real life problems?

OR

A) State and explain Kuwratoski's Theorem with suitable example. **(07)**

B) Explain Law of Large Numbers and Central Limit Theorem. How do they differ? **(08)**