E

Max. Marks : 60   Duration: 3 Hours

PART A
Answer All Questions

*(Each question carries 3 marks)*

1. Explain the role of weak ties in the theory of social sciences.

2. Briefly explain the '**Small World Phenomenon'** and the '**Six Degrees of Separation'**.

3. Explain the term 'Measuring Outcome' w.r.t a website (E-Commerce & Others). Why conversion rate alone cannot determine success of an E-Commerce site?

4. Say whether the following claim is true or false, and provide a brief (1-3 sentence) explanation for your answer. Claim: If player A in a two-person game has a dominant strategy S_A, then there is a pure strategy Nash equilibrium in which player A plays S_A and player B plays a best response to S_A.

5. How do you perform Multivariate Testing? Explain with relevance to an E-Commerce Website.

6. Explain the following:
    a. One- Mode Network
    b. Ego-Centric Network

7. Briefly explain the SIRS Epidemic Model with a neat diagram.

8. How do you measure the success of blogs? Explain

PART B

9. Explain the applications of Structural Balance in Social Networks.

OR

10 Consider the 3-node social network in figure below, in which all pairs of nodes know each other, and each pair is either friendly or hostile as indicated by the + or − label on each edge. A fourth node D wants to join this network, and establish either positive or negative relations with each existing node A, B, and C. Can node D do this in such a way that it doesn't become involved in any unbalanced triangles?
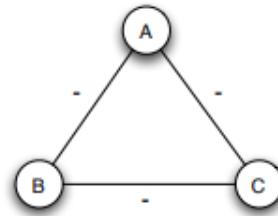

11. Explain the following Centrality measures with suitable examples:

a) Eigen Vector Centrality

b) Betweenness Centrality

c) Closeness Centrality

OR

12. In the social network depicted in the figure, with each edge labeled as either a strong or weak tie, which nodes satisfy the Strong Triadic Closure Property, and which do not? Provide an explanation for your answer.
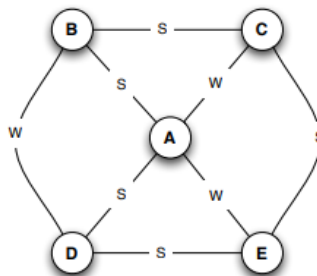
13 Consider the network depicted in the figure below; suppose that each node starts with the behavior B, and each node has a threshold of $q = 1/2$ for switching to behavior A.

(a) Now, let e and f form a two-node set S of initial adopters of behavior A. If other nodes follow the threshold rule for choosing behaviors, which nodes will eventually switch to A?

(b) Find a cluster of density greater than $1 - q = 1/2$ in the part of the graph outside S that blocks behavior A from spreading to all nodes, starting from S, at threshold q.
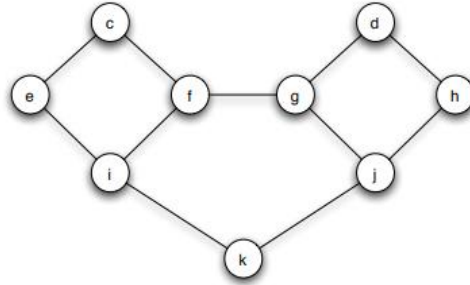

OR

14. Find all pure strategy Nash equilibria in the game below. In the payoff matrix below the rows correspond to player A's strategies and the columns correspond to player B's strategies. The first entry in each box is player A's payoff and the second entry is player B's payoff.

		Player B		
		L	M	R
Player A	t	0, 3	6, 2	1, 1
	m	2, 3	0, 1	7, 0
	b	5, 3	4, 2	3, 1

15. Suppose you are studying the spread of a rare disease among the set of people pictured in Figure .The contacts among these people are as depicted in the network in the figure, with a time interval on each edge showing when the period of contact occurred. We assume that the period of observation runs from time 0 to time 20.

 (a) Suppose that s is the only individual who had the disease at time 0. Which nodes could potentially have acquired the disease by the end of the observation period, at time 20? Explain.
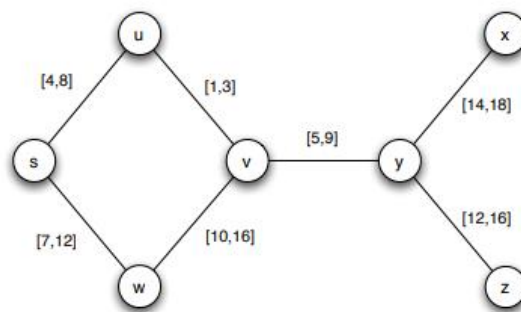

OR

16. Imagine that you know a contact graph on a set of people, but you don't know exactly the times during which contacts happened. Suppose you have a hypothesis that a particular disease passed between certain pairs of people, but not between certain other pairs. (Let's call the first set of pairs positive, and the second set of pairs negative.) Find time intervals for the edges that make it possible for the disease to flow from every node to every other node, with the one exception that it is not possible for it to flow from node a to node e? If you think it is possible, describe such a set of time intervals; if you think it is not possible, explain why no such set of time intervals exists.

17. Analyze the User Acquisition Reports for Joe's Blog as given below. The figure shows the user acquisition report for the month April 2014 and December 2014 respectively.

1. Analyze the User Acquisition Reports for the two months. Write down your observations.
2. Does the decrease in Direct Traffic affect the popularity of Joe's Blog? Explain.
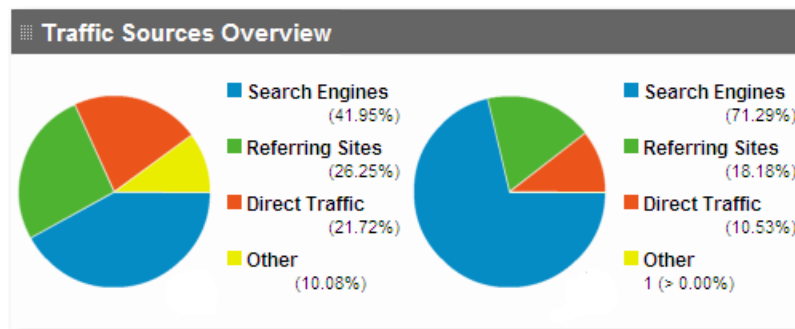
OR

18. How does the following metrics help you determine success? Explain.

    i. Cart & Checkout Abandonment Rate
   ii. Days & Visits to Purchase
  iii. Average Order Value

19. Explain the different ways in which offline customer experience can be analyzed.

OR

20. How suitable is Google Trends for keyword analysis? Explain.