

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-VII Semester (CS/IT)

COURSE CODE (CREDITS): 18B1WCI742 (2)

MAX. MARKS: 25

COURSE NAME: Artificial Intelligence

COURSE INSTRUCTORS: Dr. Aman Sharma

MAX. TIME: 1 Hour and 30 Minutes

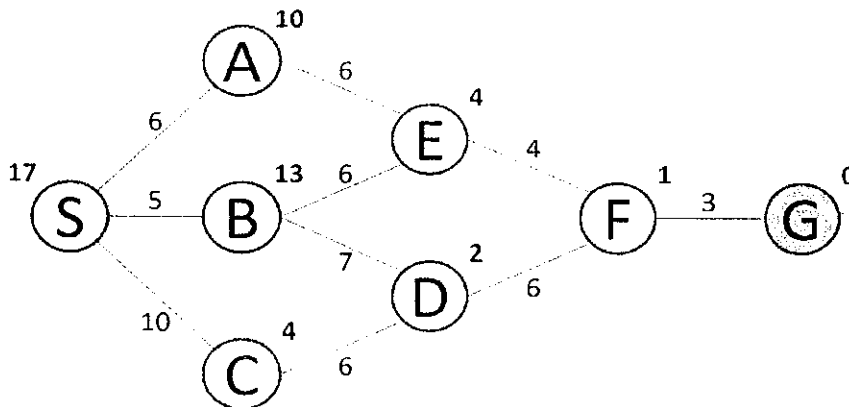
*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

**Q1.** In a bolt factory, three machines  $M_1$ ,  $M_2$ , and  $M_3$  manufacture 2000, 2500, and 4000 bolts every day. Of their output 3%, 4%, and 2.5% are defective bolts. One of the bolts is drawn very randomly from a day's production and is found to be defective. What is the probability that it was produced by machine  $M_2$ ? **[Marks: 3, CO-3]**

**Q2.** Represent all the nine statements into first order logics. 1. Lucy\* is a professor 2. All professors are people. 3. John is the dean. 4. Deans are professors. 5. All professors consider the dean a friend or don't know him. 6. Everyone is a friend of someone. 7. People only criticize people that are not their friends. 8. Lucy criticized John. Verify: Is John no friend of Lucy? **[Marks: 3, CO-2]**

**Q3.** Show that the propositional formula  $(\neg p) \wedge (\neg (p \wedge q))$  is logically equivalent to  $\neg p$ . Notice that, by De Morgan's Laws. **[Marks: 3, CO-4]**

**Q4.** Perform the A\* Algorithm on the following figure. Explicitly write down the queue at each step. **[Marks: 3, CO-2]**



**Q5.** What are semantic networks and how they are used for knowledge representation? Tom is an instance of dog. Represent the following information in the form of semantic nets: Tom caught a cat.

Tom is owned by rashan. Tom is brown in color. Dogs like bones. The dog sat on the mat. A dog is a mammal. A cat is an instance animal. All mammals are animals. Mammals have fur. [Marks: 4, CO-2]

Q6. (a) Show that  $(p \rightarrow q) \leftrightarrow (q \rightarrow p)$  is neither a tautology nor a contradiction. What does that tell you about possible relationships between the truth values of a statement and its converse? (b) Suppose  $\neg[(p \rightarrow q) \leftrightarrow (q \rightarrow p)]$  is false. Can  $p \leftrightarrow q$  have both possible truth values? Explain. [Marks: 3, CO-2]

Q7. What is random variable? Explain different types of random variable along with their probability distribution functions. Also write the necessary conditions for probability function of all types of random variables. [Marks: 4, CO-3]

(a) Find the constant  $c$  such that the function is a density function, and (b) compute  $P(1 < X < 2)$ .

$$f(x) = \begin{cases} cx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$$

Q8. The discrete random variable  $X$  has the probability function:

[Marks: 2, CO-3]

$$P(X = x) = \begin{cases} kx & x = 2, 4, 6 \\ k(x - 2) & x = 8 \\ 0 & \text{otherwise} \end{cases}$$

Find the value of  $k$  and  $P((2 < X < 6) / (X > 6))$ .

\*\*\*\*\*Best of Luck\*\*\*\*\*