RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, JULY 2021

THIRD YEAR [BATCH 2018-21]

Date : 13/07/2021 **COMPUTER SCIENCE (HONOURS)**

Time : 11.00 am - 3.00 pm **Paper : VII** Full Marks : 100

Group - A

Answer **any one** question of the following : [1×5]

1) What will be the new position of the point (1,2,3) after taking reflection about x-y plane followed by clockwise 60° rotation about y-axis?

2) State whether the following statements are true or false. Justify your answer:

   a) A perspective projection preserves relative proportions,

   b) Bresenham's line drawing algorithm is more efficient than DDA algorithm. (2.5+2.5)

Answer **any two** questions of the following : [2×10]

3) a) How long it would take to load a 1280 × 1024 frame buffer with 12 bit per pixel if 10^5 bits can be transferred per second?

   b) Using Midpoint circle drawing algorithm to plot the curve section in 1^{st} quadrant until x<y, find out the pixel positions for circle with centre at (5, 5) having radius of 8 units.

   c) When do we use 8 connected rule instead of 4 connected rule? (2+6+2)

4) a) Find the transformation matrix to zoom as twice in size of a square with two diagonal corner points (2,2) and (4,4). Hence determine the new locations of the given corner points.

   b) State and prove any three properties of Bezier curve. (5+5)

5) a) Which part of the line segment with end points (4, 11), (12, 6) should be clipped as visible against the window having two diagonal corner points (3, 2) and (9, 9)? Explain with necessary steps.

   b) Let origin be the centre of projection. Find out the perspective projection of a point (5,7,8) when the projection plane passes through the point (2,2,4) and has normal vector (-1,1,1). (5+5)

6) a) Write short note on JPEG format.

   b) Differentiate between GIF and PNG files.

   c) Briefly discuss about the different steps required for animation sequence.

   d) To transform a polygon having 6 edges into polygon with 10 edges, what will be the pre-processing rules for equalizing key frames in terms of the number of vertices to be added? (2+2+3+3)

Group - B

Answer **any one** question of the following : [1×5]

7) Compare time domain and frequency domain representation of an analog signal with example. (5)

8) Assume seven devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device? Show with a diagram. (3+2)

Answer **any four** questions of the following : [4×10]

9) a) A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000 KHz. What is the maximum data rate supported by this line?

b) Encode 0101101010 using Polar RZ scheme.

c) Suppose a computer sends a packet at the network layer to another computer somewhere in the Internet. The logical destination address of the packet is corrupted. What happens to the packet? How can the source computer be informed of the situation? (3+3+4)

10) a) What are the advantages of using artificial satellite rather than natural satellite?

b) We mentioned that two types of networks, datagram and virtual-circuit, need a routing or switching table to find the output port from which the information belonging to a destination should be sent out, but a circuit-switched network has no need for such a table. Give the reason for this difference.

c) What are the differences between a frame and a packet in perspective of computer network?

d) Differentiate between PCM and DM. (2+3+3+2)

11) a) Find the minimum hamming distance for the following cases:

i) Detection of two errors.

ii) Correction of two errors.

b) Given the dataword 10100111 and the divisor 10111, where size of dataword k=8 and size of codeword n=12.

i) Show the generation of the codeword at the sender site.

ii) Show the checking of the codeword at the receiver site assuming no error has occurred.

([2+2]+[3+3])

12) a) Write down the advantages of using QPSK over BPSK.

b) Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols?

i) Stop-and-Wait ARQ

ii) Go-Back-N ARQ

c) Compare the TCP header and the UDP header. List the fields in the TCP header that are missing from UDP header. Give the reason for their absence. (2+[2+2]+4)

13) a) How does sky propagation differ from line-of-sight propagation?

b) What is the advantage of using ADSL modem over traditional modem?

c) A router with IPv4 address 125.45.23.12 and Ethernet physical address 23:45:AB:4F:67:CD has received a packet for a host destination with IP address125.11.78.10. Show the entries in the ARP request packet sent by the router. Assume no subnetting.

d) A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/n notation. (2+2+2+4)

14) a) Write down differences between telnet and ssh.

b) Explains how can a web server handles massive amount of client requests in a short period of time?

c) How is HTTP related to WWW?

d) What is the function of the twisting in twisted-pair cable? (3+3+2+2)

Group - C

Answer **any three** questions of the following : [3×10]

15) a) Given a full 7-gallon jug and an empty 5-gallon jug, the goal is to fill any jug with exactly one gallon of water. You may use the following state space formulation.

State = (x,y), where x is the number of gallons of water in the 7-gallon jug and y is number of gallons in the 5-gallon jug;

Initial State = (0,0);

Goal State = (*,1) or (1,*) where * means any amount.

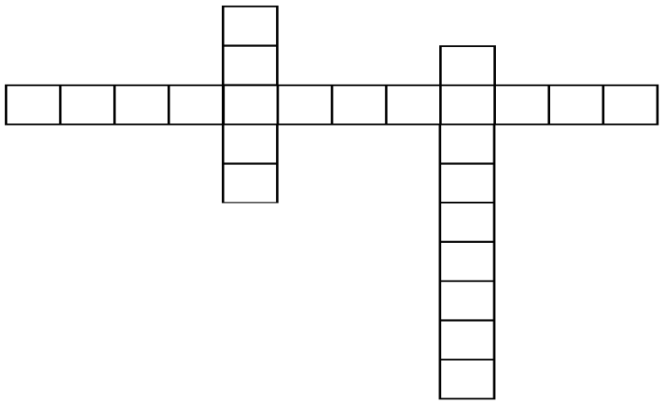
Show the different operators/rules and their effects. Also select a path to solution with those operators/rules.

b) Demonstrate Best First search with a suitable example. (6+4)

16. a) Consider the crossword puzzle problem. Assume that you have a set of words W1, W2,...Wn and a crossword puzzle grid. The goal is to fill the crossword grid with the words such that letters of intersecting words match.

Words: VIDYAMANDIRA, STATE, EDUCATION

Puzzle:



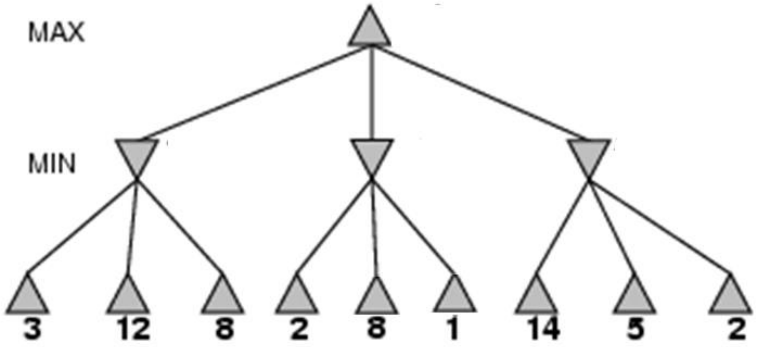
Provide a constraint satisfaction problem formulation for this variant of the crossword puzzle problem.

i) Specify the variables to which values are to be assigned.

ii) Specify the domains from which the variables take their values.

iii) Define the constraints that must hold between variables. Please provide pseudo-code defining the constraints explicitly.

b) Show α-β pruning on the following tree:



(6+4)

17) a) Assume the following facts:

- Bob only likes easy courses.
- Science courses are hard.
- All the courses in the arts department are easy
- PLSA301 is an arts course.

Use resolution to answer the question "What course would Bob like?"

b) Describe Unification and Substitution in FOPL with suitable examples. (6+4)

18) a) Consider a knowledge base (KB) that contains the following propositional logic:

- $Q \Rightarrow P$
- $P \Rightarrow \neg Q$
- $Q \vee R$

i) Construct a truth table that shows the truth value of each sentence in KB and indicate the models in which the KB is true.

ii) Does KB entail R? Use the definition of entailment to justify your answer.

b) What are the advantages of FOPL over propositional logic? Explain with example. ([3+3]+4)

19) a) Find the fuzzy cardinality of a fuzzy set LC of low calorie food. The fuzzy set is given below:

$$\underline{LC} = \frac{1}{Cucumber} + \frac{1}{Watermelon} + \frac{0.5}{Chicken} + \frac{0.1}{Ice-cream} + \frac{0.1}{Chocolate} + \frac{0.3}{Rice} + \frac{0.8}{Egg}$$

b) Draw a truth table for AND-NOT operation for two Boolean variables x_1 and x_2. The operation goes like x_1 AND (NOT x_2). Implement this logical operation with a McCulloch-Pitts neuron. (5+5)

———— × ————