



Please answer the following questions:

Q1: Write short notes for the following: (20% points)

1. Areas of Artificial Intelligence.
2. What is Computer vision? Applications of it.
3. What is an expert system? Basic Functions of Expert Systems.
4. Advantages of Expert Systems.
5. Considerations for Building Expert Systems.
6. Categories of Knowledge
7. Types of Inference
8. Binary Decision Tree with N nodes, give an example
9. Mobile robot and its categories.
10. Robot Applications indoor and outdoor

Q2: Write the differences between the following: (20% points)

1. Strong AI and weak AI
2. Problem domain vs. knowledge domain
3. Procedural and nonprocedural Languages
4. Acyclic graphs and connected graphs
5. Schemata and frames, give example
6. OAV and HAS-A semantic nets, give example
7. Image filtering and processing line drawings.
8. Markov algorithm and Rete algorithm
9. Manipulator robots and humanoid robots
10. Sensors and actuators in mobile robot.

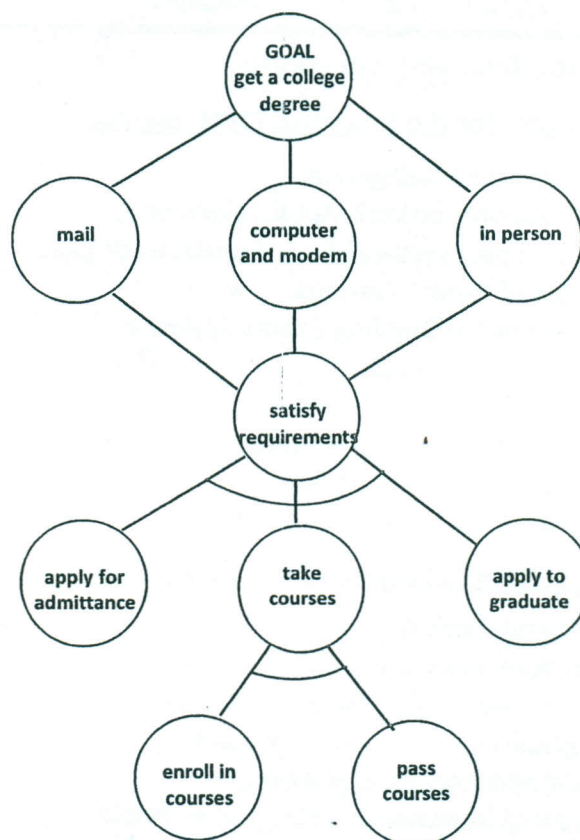
Q3: Check if the following Syllogisms are valid using Venn Diagram: (15% points)

- A. Major Premise: All microcomputers are computers
Minor Premise: No mainframe is a microcomputer
Conclusion: No mainframe is a computer
- B. Major Premise: Some computers are laptops
Minor Premise: All laptops are transportable
Conclusion: Some transportable are computers

Q4: Identify a person other than yourself who is considered either an expert or very knowledgeable. Interview this expert and discuss how well this person's expertise would be modeled by an expert system in terms of each criterion in the "Advantages of Expert Systems". Write ten nontrivial rules expressing the knowledge of the expert.

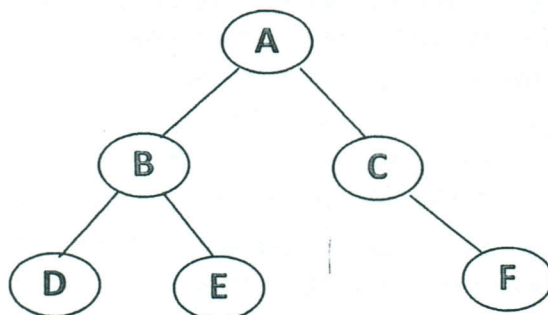
(15% points)

Q5: Explain the following Lattice on how to obtain a college degree. Then obtain the AND-OR gate representation for this figure. **(15% points)**



Q6: For the following tree, show the sequence of processing nodes for: **(15% points)**

- A. Depth-first traversals (Preorder, inorder, and postorder)
- B. Breadth-first traversals



Good luck.

Dr. Abdelhameed Fawzy (20/1/2013)

[1-a] Write short notes about:-

Elements of instrumentation system.
Selecting points of transducers.
Functions of measurement systems.

Basic components of DAS.
Loading error effect.
Hall effect transducer.

[1-b] A 12 V DC power supply, and $5K\Omega$ voltage dividing potentiometer feeds a load of $8K\Omega$.

i- Drive a mathematical expression for loading error.

ii- Calculate the percentage error based upon full scale for slider positions of 0.8 of the total value .

[2-a] Explain the function and theory of operation of the following:-

Pressure sensing elements.

LVDT.

Flow Rate sensing elements.

Liquid level transducers.

Mechanical sensing elements.

Temperature transducers.

[2-b] A flat circular diaphragm of mild steel having a diameter of 15 mm , and its thickness is 0.3 mm, the Young's modulus is 200 GN/m^2 , and the Poisson's ratio is 0.28. Find the deflection at the centre for a pressure of 150 KN/m^2 .

[3-a] Write the differences between:-

Deflection & Null Instruments.

Analog & Digital Instruments.

Active & Passive Transducers.

Primary & Secondary Transducers.

Inductive & Capacitive Transducers.

Eddy current & Toothed Rotor Tachometer.

[3-b] A barium titanate Piezo-electric crystal has the dimensions of 6mm x 6mm x 1.5mm. and voltage sensitivity is 0.012 Vm/N , relative permittivity is 1400, the modulus of elasticity is $12 \times 10^{10} \text{ N/m}^2$. The force acting on the crystal is 10 N , $\epsilon_0 = 8.854 \text{ PF/m}$.

i- Drive a mathematical expression for the output voltage .

ii- Calculate output voltage, charge sensitivity, and capacitance of the crystal.

[4-a] What is Telemetry?. Explain with drawing the basic components of telemetry system, and discuss the concepts and applications of it.

[4-b] A capacitance transducer of two parallel plates of dimensions of 20mm x 30mm and separated 2.5 mm apart.

i- Drive a mathematical expression for both sensitivity and change in capacitance due to varying the distance between the plates.

ii- Calculate the change in capacitance when distance between the plates decreased by 5mm. given $\epsilon_0 = 8.854 \text{ PF/m}$, and $\epsilon_r = 81$