SWE 4/2 (2023-2); SPM; TT#1; Marks: 15 , Time: 30 mins

1. Define software project management. (2)
2. What is Work Breakdown Structure (WBS)? Show the hierarchical diagram of a simple PBS. (4)
3. What are the phases in systems development life cycle (SDLC)? (3)
4. Write the goals of project management. (2)
5. What are called "free floats" and "interfering floats"? How are they calculated? (4)

CamScanner

TT#01 Course: Machine Learning (**SWE 427**) (*QT-A*)

Marks: 20 Time: **30 mins**

---

1. Does gradient descent require a convex cost function to converge? Can we use Mean Squared Error for calculating gradient descent of Logistic Regression to converge to the global optima? If not, why? **05**
2. Explain the role of the learning rate in gradient descent. What are the potential consequences of setting it too high or too low? **05**
3. Create a fictional case study where the improper use of regularization leads to significant model failures. What lessons can be learned from this scenario? **05**
4. How do filters extract features and how does pooling simplify them in a CNN? Explain in brief. **05**

CamScanner

CT#2; SPM - 2023; Time: 25 Minutes; Marks: 10

Explain the types of contracts and their stages in contract placement in detail.

Or

How do you prioritize the data collection using Earned Value analysis? Discuss with suitable illustrations.

CamScanner

Shahjalal University of Science and Technology
Institute of Information and Communication Technology (IICT)
Software Engineering
4th Year 2nd Semester, TT#2 (Session: 2018-19)
Course Code: SWE 421 Credits: 3 Course Title: Artificial Intelligence
Time: 30 minutes Total Marks: 20

1. Answer all the questions **5x4=20**

a) Write down the steps of IDA* Algorithm.
b) Describe a scenario where hill climbing may get stuck in a local optimum.
c) Discuss the remedies of hill climbing search.
d) Describe the simulated annealing process. Discuss the role of temperature in simulated annealing.

CamScanner

TT#01 Course: Machine Learning (**SWE 427**) (*QT-B*)

Marks: 20 Time: **30 mins**

---

1. How does logistic regression differ from linear regression in terms of the nature of the dependent variable and the type of problems it solves? **05**
2. Explain the role of the learning rate in gradient descent. What are the potential consequences of setting it too high or too low? **05**
3. Create a fictional case study where the improper use of regularization leads to significant model failures. What lessons can be learned from this scenario? **05**
4. Provide a detailed mathematical breakdown of the forward propagation process in a simple neural network. **05**

CamScanner

TT #02 Course: Machine Learning (**SWE 427**) (*QT-A*)

Marks: 20 (8+12) Time: **30 mins**

---

1. What are support vectors? How do support vectors help to find the optimal margin of a model?
2. Given the data in the table below, reduce the dimensions from 2 to 1 using the PCA algorithm.

X_1	X_2
1	2
3	4
5	6
7	9

CamScanner

1 Three-dimensional transformation:

- $R_{\theta,K} = \begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$
- $R_{\theta,J} = \begin{pmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{pmatrix}$
- $R_{\theta,I} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{pmatrix}$
- $A_{v,K} = \begin{pmatrix} \frac{\lambda}{\lvert v\rvert} & \frac{-ab}{\lambda\lvert v\rvert} & \frac{-ac}{\lambda\lvert v\rvert} \\ 0 & \frac{c}{\lambda} & \frac{-b}{\lambda} \\ \frac{a}{\lvert v\rvert} & \frac{b}{\lvert v\rvert} & \frac{c}{\lvert v\rvert} \end{pmatrix}$
- $A^{-1}_{v,K} = \begin{pmatrix} \frac{\lambda}{\lvert v\rvert} & 0 & \frac{a}{\lvert v\rvert} \\ \frac{-ab}{\lambda\lvert v\rvert} & \frac{c}{\lambda} & \frac{b}{\lvert v\rvert} \\ \frac{-ac}{\lambda\lvert v\rvert} & \frac{-b}{\lambda} & \frac{c}{\lvert v\rvert} \end{pmatrix}$
- $T_{a,b,c} = \begin{pmatrix} 1 & 0 & 0 & a \\ 0 & 1 & 0 & b \\ 0 & 0 & 1 & c \\ 0 & 0 & 0 & 1 \end{pmatrix}$

2 Viewing & Clipping:

- $N = \begin{pmatrix} 1 & 0 & v_{x_{\min}} \\ 0 & 1 & v_{y_{\min}} \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 & -w_{x_{\min}} \\ 0 & 1 & -w_{y_{\min}} \\ 0 & 0 & 1 \end{pmatrix}$
- $S_x = \frac{v_{x_{\max}} - v_{x_{\min}}}{w_{x_{\max}} - w_{x_{\min}}}$
- $S_y = \frac{v_{y_{\max}} - v_{y_{\min}}}{w_{y_{\max}} - w_{y_{\min}}}$

3 Two-dimensional transformation:

Geometric	Coordinate
$R_\theta = \begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$	$\bar{R}_\theta = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$
$M_x = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$	$\bar{M}_x = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$
$M_y = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$	$\bar{M}_y = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
$S_{s_x,s_y} = \begin{pmatrix} s_x & 0 \\ 0 & s_y \end{pmatrix}$	$\bar{S}_{s_x,s_y} = \begin{pmatrix} \frac{1}{s_x} & 0 \\ 0 & \frac{1}{s_y} \end{pmatrix}$

CamScanner

Shahjalal University of Science and Technology
Institute of Information and Communication Technology (IICT)
4^{th} year 2^{nd} Semester Final Examination - 2021
Session—2018-19 Course No.—SWE 423
Course Title—Computer Graphics & Image Processing
Time—3 Hours Credit: 3.00 Total Marks#100

Part A

1. Answer the following Questions (Any Five). $5 \times 2 = 10$

   (a) What is the resolution of an image?

   (b) If we use direct coding with 8 bits per primary color, how many possible colors do we have for each pixel?

   (c) What do you require for 3D viewing an object? Mathematically how do you specify the view plane?

   (d) Ideally view volume is infinite but in reality we prefer to use a finite volume, why?

   (e) How do you specify the finite view volume?

   (f) If $d_i = -3$, $x_i = 3$, $y_i = 2$ what will be the x_{i+1} *and* y_{i+1} for Bresenham's line drawing algorithm?

   (g) The direct coding method is flexible in that it allows the allocation of a different number of bits to each primary color. If we use 5 bits each for red and blue and 6 bits for green for a total of 16 bits per pixel, how many possible simultaneous colors do we have?

2. Answer the following Questions (Any Four). $4 \times 5 = 20$

   (a) Under the standard perspective transformation P_{erk}, what is the projected image of a point in the place $z = -d$? What does this anomaly called?

   (b) Given points $P_1(1, 2, 0)$, $P_2(3, 6, 20)$ and $P_3(2, 4, 6)$ and a viewpoint $C(0, 0, -10)$, determine which points obscure the others when viewed from C.

   (c) When eight-way symmetry is used to obtain a full circle from pixel coordinates generated for the first octant, certain pixels are set or plotted twice. This phenomenon is sometimes referred to as over-strike. How to remove this over-strike phenomenon?

   (d) Compare between 'Brasenham's', and 'Direct' line drawing approach.

   (e) What steps are required to plot a dashed circle? Modify Brasenham's circle drawing algorithm to achieve this.

   (f) Apply Bresenham's line algorithm to draw a line from (2,3) to (8,12). Show the steps and the resulting pixel coordinates.

3. Answer the following Questions (Any TWO). $2 \times 10 = 20$

   (a) Let R be a rectangular window whose lower left-hand corner is at L(-3,1) and upper right-hand corner is at R(2,6).

      [i] Find the region codes for the endpoints $A(-2, 3) \rightarrow B(1, 2)$, $C(-4, 7) \rightarrow D(-2, 10)$ and $E(-4, 2) \rightarrow F(-1, 7)$.

      [ii] Find the clipping categories for the line segment in part-i.

      [iii] Use the Cohen-Sutherland algorithm to clip the line segments in part-i.

   (b) Triangle ABC where the vertices of $\triangle ABC$ are A(-1,-3), B(-4,-1), and C(-6,-4) undergoes a composition of transformations described as: a translation 10 units to the right, then a reflection in the x-axis. After all the transformations are applied what will be the triangle coordinates?

   (c) Reflect the diamond-shaped polygon whose vertices are A(-1, 0), B(0, -2), C(1, 0), and D(0, 2) about the horizontal line $y = 3$.

Part B

4. Answer the following Questions (Any Five). $5 \times 2 = 10$

   (a) What is "Histogram Equalization" in image processing?

   (b) What is region code? What does each bit represent?

   (c) What is "Analog Image"?

   (d) Find the transformation that scales (with respect to the origin) by 'a' units in the X direction for point P(x,y).

   (e) What are the conditions for the clipping candidate in the Cohen-Sutherland algorithm?

   (f) How do you model an object in computer graphics?

   (g) What are the geometric forms used for modeling of objects?

5. Answer the following Questions (Any Four). $5 \times 4 = 20$

   (a) Find the normalization transformation that maps a window whose lower left corner is at (1,1) and upper right corner is at (3,5) onto a viewport that is the entire normalized device screen.

   (b) What are the types of Image Compression Techniques? Differentiate between them.

   (c) Apply Cohen-Sutherland line clipping to clip a line segment with endpoints $(-5, 4)$ and $(7, 10)$ against a window with corners $(-3, 8)$ and $(5, 6)$.

   (d) The matrix $\begin{pmatrix} 1 & a \\ b & 1 \end{pmatrix}$ defines a transformation called a simultaneous shearing or shearing for short. The special case when $b = 0$ is called shearing in the x direction. When $a = 0$ we have shearing in the y direction. Illustrate the effect of these shearing transformations on the square A(0,0), B(1,0), C(1,1), and D(0,1) when a=2 and b=3. Draw suitable diagrams.

   (e) Tilting is defined as a rotation about the x-axis followed by a rotation about the y-axis: (i) find the tilting matrix; (ii) does the order of performing rotation matter? Show mathematically.

   (f) Show that $S_{a,b} \cdot S_{c,d} = S_{c,d} \cdot S_{a,b} = S_{ac} \cdot S_{bd}$.

6. Answer the following Questions (Any Two). $2 \times 10 = 20$

   (a) Use the Cohen-Sutherland algorithm to clip two lines P1(35,10)- P2(65,40) and P3(65,20)-P4(95,10) against a window A(50,10), B(80,10), C(80,40) and D(50,40). Also, find the clipping position.

   (b) Find a transformation A_V which aligns a given vector V with the vector K along the positive z axis.

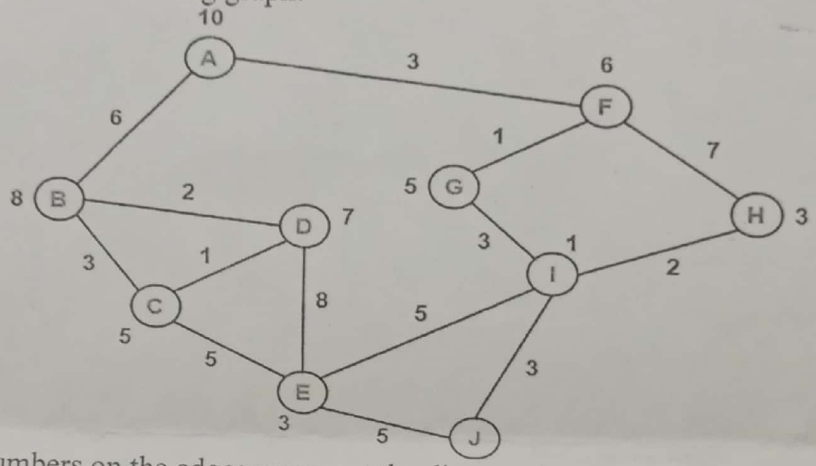
   (c) Under the standard perspective transformation P_{erk}, what is the projected image of the line segment joining $P_1(-1, 1, -2d)$ to $P_2(2, 2, 0)$. Use suitable figures.

CamScanner

Shahjalal University of Science and Technology
Institute of Information and Communication Technology (IICT)
Software Engineering
4th Year 2nd Semester (Session: 2018-19)
Course Title: Artificial Intelligence
Term test #1 Time:40 minutes

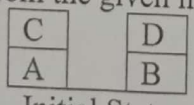
Answer all the following questions:

1. What is a "rational agent"? 01
2. What is heuristic search? 01
3. Differentiate between State space and Search space. 04
4. Explain the following agent type: Goal-based, Utility-based 04
5. Consider the following graph: 10

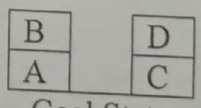


The numbers on the edges represent the distance between the nodes and the numbers on the nodes represent the heuristic value. Find the most cost-effective path to reach from start state A to final state J using A* algorithm.

6. What are the assumptions of a blocks world environment? Suppose a robot hand can perform the following four actions: UNSTACK(x, y), STACK(x, y), PICKUP(x) and PUTDOWND(x). Find the solution for moving the blocks from the given initial state to the goal state. 10



Initial State



Goal State

(B, A)

A.

US → C → P.d(C)
US → D → P.d(D
P.U → B → St(A, B)
P.U → C → Stat(a, c)

A.

Computer Graphics TT 01

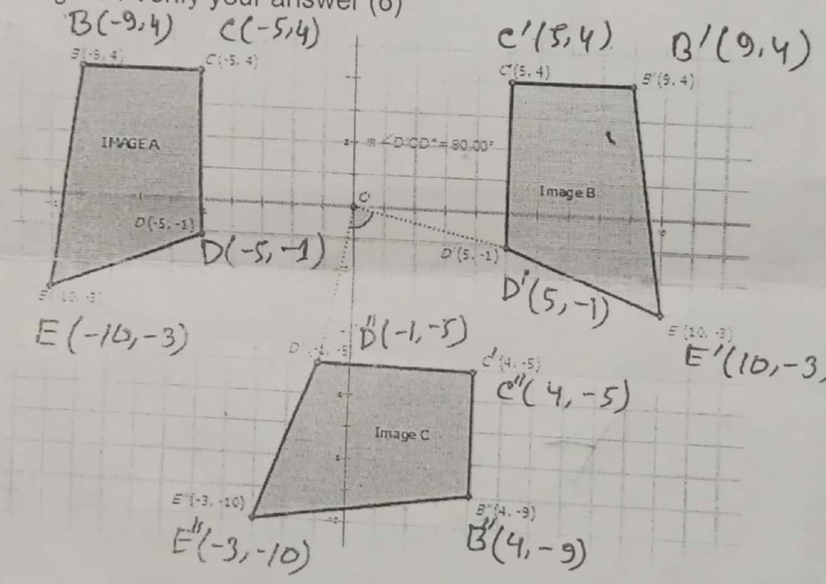
Full Marks: 20 | Course Code: SWE 423 | Time: 40 mins

1. What is 8-way symmetry for a Circle? Explain. (2+2)

2. In Brasenham's Circle drawing algorithm, we defined the decision variable $d\_i = D(T) + D(S)$ where T is the top pixel and S is the lower. Is there any chance that $d\_i = 0$ but pixels S and T are not equally far from the true circle? Justify your answer. (5)

3. Modify the "Midpoint circle drawing" algorithm pseudocode to draw a dashed circle. A "dashed circle" generally refers to a circular shape or outline where the perimeter is represented by a dashed or dotted line rather than a solid line. (5)

4. Define the possible steps & find the composite matrix to transform 'Image A' to 'Image C'. Verify your answer (6)



initial variable, $x = 0$, $y = r$

decision variable, $(1 - r)$

$A \times B \times C$

$= A \times (B \times C)$

$c = y - m(x_k + 1)$

$= y - \frac{\Delta y}{\Delta x}(x_k + 1)$

Shahjalal University of Science and Technology
Institute of Information and Communication Technology
SWE 4th Year 2nd Semester Final Examination 2021
Course: SWE 425 (Software Project Management)
Credits: 2.0 Full Marks: 50 Time: 2 Hours
[Answer every question]

Group A

Q.1 Answer any 5 questions. [5 x 1=5]

a) List two problem with software projects.
b) What is called Return on Investment?
c) What are the Managerial activities?
d) Give any two examples for personnel attributes.
e) Write the disadvantages of function point analysis
f) Write any two advantages of function print analysis
g) What are the key elements to review when assessing project resource requirements?

Q.2 Answer any 5 questions. [5 x 2=10]

a) How do unclear requirements pose a risk to a software project? Explain with an example.
b) Write any five competencies of project management skills.
c) Write the difference between the project process and the product process.
d) What is the significance of identifying the critical path in project management?
e) Explain total slack.
f) What is mean by known risk?
g) What is the significance of "working in groups"?

Q.3 Answer any 2 questions. [2 x 5=10]

a) Take a scenario in which a project manager is managing a software development project with known external dependencies. How should the manager effectively anticipate and mitigate the risks arising from these dependencies?
b) Explain how the delayed projects can be brought back on track.
c) Discuss the step-wise project planning with an example.
d) Explain the key objectives of activity planning in project management, and provide examples of how they can impact project success.

Group B

Q.4 Answer any 5 questions. [5 x 1=5]

a) How do personnel attributes impact resource allocation within a project?
b) State two disadvantages of function point analysis.
c) Mention one purpose of Software Quality Assurance (SQA).
d) Write some ways to collect information for system requirements.
e) What is structured data?
f) What is milestone?
g) Define process.

Q.5 Answer any 5 questions. [5 x2 = 10]

a) What is Work Breakdown Structure (WBS)?
b) Differentiate Leaders and managers.
c) Define project portfolio.
d) What constitutes a Hazard?
e) What factors are considered when selecting a development methodology and life cycle approach for a project?
f) How customer risks are derived?
g) What are the main elements included in a Software Project Management Plan (SPMP)?

Q.6 Answer any 2 questions. [2 x5=10]

a) What is project Evaluation? Why do we need it? Describe how a project can be evaluated.
b) Describe type of project costs with a cost-duration graph.
c) If a project manager must review overall resource estimates, discuss how they would approach this task and analyze the potential impact on the project budget and timeline.
d) Compare 'Theory X' and 'Theory Y' regarding organizational behavior.

CamScanner