Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065388833
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 216 Question Id : 640653614199 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DEGREE LEVEL : REINFORCEMENT LEARNING (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406532050490. ✔ YES

6406532050491. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	64065388834
Question Shuffling Allowed :	Yes
Is Section Default? :	null

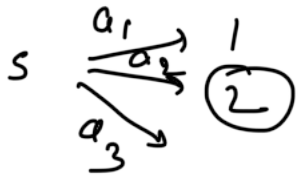
Question Number : 217 Question Id : 640653614200 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

In an MDP, three actions are possible from a state s. The optimal action values for two of these actions from this state are 1 and 2. If the optimal state value for s is 2, what could be said about the optimal action value for the other action from this state?

Options :



6406532050492. ✖ It has to be at least 2

6406532050493. ✖ It has to be at least 1

6406532050494. ✔ It has to be at most 2

6406532050495. ✖ It has to be at most 1

6406532050496. ✖ It has to be equal to 2

Question Number : 218 Question Id : 640653614201 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

What is the value of the following expression?

$$\sum_{a} \pi(a \mid s) \cdot \sum_{s',r} p(s', r \mid s, a) \left[r + \gamma \sum_{a'} \pi(a' \mid s') \cdot q_{\pi}(s', a') \right]$$

Options :

6406532050497. ✔ $v_\pi(s)$

6406532050498. ✖ $q_\pi(s,a)$

6406532050499. ✖ $v_*(s)$

6406532050500. ✖ $q_*(s,a)$

Question Number : 219 Question Id : 640653614202 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Select the most appropriate statement concerning the behaviour policy in Q-learning.

Options :

6406532050501. ✔ The behaviour policy in Q-learning **can be** an equiprobable random policy.

6406532050502. ✖ The behaviour policy in Q-learning **can be** a deterministic policy.

6406532050503. ✖ The behaviour policy in Q-learning **has to be** an ϵ-soft policy.

6406532050504. ✖ The behaviour policy in Q-learning **has to be** an ϵ-greedy policy.

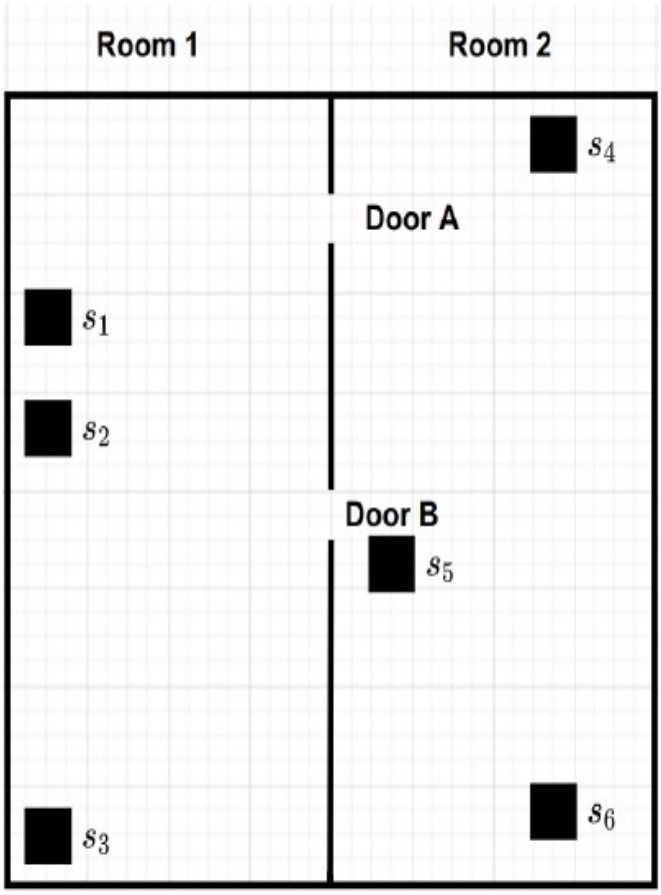
Question Number : 220 Question Id : 640653614203 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following grid world:



The grid world has two doors A and B and six specific states/positions s_1 to s_6. π_1 represents the optimal policy to reach from *anywhere* in Room 1 to Room 2. At any state in the grid world, an agent can take only 4 actions (up, down, left, right), the actions that take the agent out of the grid world or on obstacles (i.e. walls) don't change the state. If an agent is trained from scratch, for which of the following, the agent will **NOT** follow policy π_1 to reach room 2?

Options :

6406532050505. ✖ Starting state: s_1, goal state:s_4

6406532050506. ✔ Starting state: s_1, goal state:s_5

6406532050507. ✖ Starting state: s_3, goal state:s_6

6406532050508.

✖ Starting state: s_3, goal state:s_5

Question Number : 221 Question Id : 640653614204 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Given a problem with a well defined hierarchy, what ordering would you expect on the total expected reward for a hierarchically optimal policy (H), a recursively optimal policy (R) and a flat optimal policy (F)?

Options :

6406532050509. ✖ $R \leq F \leq H$

6406532050510. ✖ $F \leq R \leq H$

6406532050511. ✔ $R \leq H \leq F$

$R < H < F$

6406532050512. ✖ $F \leq H \leq R$

Question Number : 222 Question Id : 640653614205 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following corresponds to an update for the actor in the case of one-step actor-critic method?

Options :

6406532050513. ✔ $$\boldsymbol{\theta}_{t+1} := \boldsymbol{\theta}_t + \alpha\delta_t \frac{\nabla\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}{\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}$$

6406532050514. ✖ $$\boldsymbol{\theta}_{t+1} := \boldsymbol{\theta}_t + \alpha \frac{\nabla\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}{\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}$$

6406532050515. ✖ $$\boldsymbol{\theta}_{t+1} := \boldsymbol{\theta}_t + \alpha G_t \frac{\nabla\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}{\pi(A_t \mid S_t, \boldsymbol{\theta}_t)}$$

6406532050516. ✖ $$\boldsymbol{\theta}_{t+1} := \boldsymbol{\theta}_t + \alpha\delta_t \nabla\pi(A_t \mid S_t, \boldsymbol{\theta}_t)$$

Sub-Section Number :	3
Sub-Section Id :	64065388835
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 223 Question Id : 640653614206 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider a multi-armed bandit problem with 5 arms in which the softmax strategy is used to find the optimal arm. The temperature parameter is τ. Assume that the Q values have been estimated correctly for all five arms. Let π be the distribution induced by the softmax function over the arms. Select all true statements.

Options :

6406532050517. ✖ As $\tau \to 0$, π tends to an equiprobable random policy.

6406532050518.

✔ As $\tau \to 0$, π tends to a deterministic, greedy policy.

6406532050519. ✔ As $\tau \to \infty$, π tends to an equiprobable random policy.

6406532050520. ✖ As $\tau \to \infty$, π tends to a deterministic, greedy policy.

Sub-Section Number : 4

Sub-Section Id : 64065388836

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 224 Question Id : 640653614207 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Select all true statements.

Options :

6406532050521. ✔ Policy gradient methods use a parameterized policy that can select actions without consulting a value function.

6406532050522. ✖ Policy gradient methods **must** use a value function to learn the policy parameters.

6406532050523. ✖ According to the policy gradient theorem, computing the gradient of the performance requires the computation of the gradient of the state distribution $\mu(s)$.

6406532050524. ✔ In REINFORCE with baseline, the baseline **cannot** be a function of the actions.

Sub-Section Number : 5

Sub-Section Id : 64065388837

Question Shuffling Allowed : Yes

Is Section Default? : null

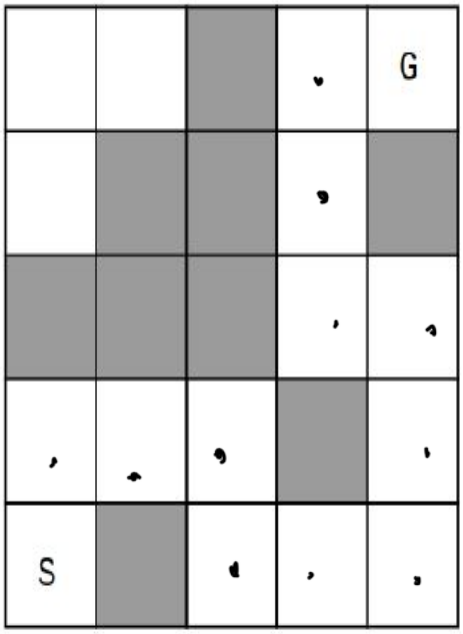
Question Number : 225 Question Id : 640653614208 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Consider the following grid-world in which all transitions are deterministic. S is the start state, G is the goal and the gray cells are obstructions.



The agent gets a reward of 10 when it reaches the goal state. For all other transitions, the reward is 0. Actions that take the agent out of the grid or into the obstructions leave the state unchanged. If $\gamma = 0.9$, find the maximum possible return for the agent starting from state S. Enter your answer correct to three decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.30 to 0.33

$(0.9)^{11}$

$= 0.313$

Question Number : 226 Question Id : 640653614210 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Consider the following episodes with two non-terminal states A and B and a terminal state C.
Each row corresponds to one episode:

episode							
(1)	A	1	B	2	A	0	C
(2)	B	1	B	2	A	2	C
(3)	A	1	B	-1	A	-1	C
(4)	B	-1	B	2	A	3	C
(5)	A	0	A	1	A	3	C

What is the estimate of $V(B)$ using every-visit MC? $\gamma = 1$ for this problem.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

3

Question Number : 227 Question Id : 640653614211 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Consider a binary bandit, with policy described as follows:

$$\pi(a, \theta) = \begin{cases} \theta, & \text{if } a = 1 \\ 1 - \theta, & \text{if } a = 0 \end{cases}$$

At the beginning $\theta = 0.5$. What will be probability of pulling arm $a = 1$ after pulling arm $a = 1$ and receiving reward of $+2$. Assume baseline to be 0 and learning rate (ρ) to be 0.01.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.51

0.5 + 0.01

0.51

Question Number : 228 Question Id : 640653614212 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Consider a 4-armed bandit, with policy presented by softmax. Initially $\theta_i = 1,\ \forall i \in [1,4]$. In the very first pull, arm 1 is pulled and the received reward is $+4$. What will be θ_2 after the update? Assume baseline to be 0 and learning rate (α) to be 0.1.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.9

$\theta_1 = 4$

$\theta_2 = \alpha \theta_i$

$= 0.1 \times 1$

$= 0.1$

$1 - 0.1 = 0.9$

Sub-Section Number : 6

Sub-Section Id : 64065388838

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 229 Question Id : 640653614209 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

Which of the following is the TD error used in the *TD*(0) algorithm?

Options :

6406532050526. ✖ $R_{t+1} + \gamma V(S_t) - V(S_t)$

6406532050527. ✔ $R_{t+1} + \gamma V(S_{t+1}) - V(S_t)$

6406532050528. ✖ $R_{t+1} + \gamma \Big[V(S_{t+1}) - V(S_t) \Big]$

6406532050529. ✖ $V(S_{t+1}) - V(S_t)$

Sub-Section Number :	7
Sub-Section Id :	64065388839
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653614213 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (230 to 231)

Question Label : Comprehension

Consider a **linear** function approximator in which the weight vector is in $\mathbb{R}^5$.
To begin with, the weights are initialized to zero, $\mathbf{w}_0 = [0 \quad 0 \quad 0 \quad 0 \quad 0]^T$.
The first transition used to update the weights is given below:

$$S_0 = s_0$$
$$A_0 = a_0$$
$$R_1 = 10$$
$$S_1 = s_1$$

It is given that $\phi(s_0, a_0) = [1 \quad 0 \quad -1 \quad 0 \quad 1]^T$. Perform one update of semi-gradient TD with $\gamma = 0.9$ and $\alpha = 0.1$ to get $\mathbf{w}_1$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 230 Question Id : 640653614214 Question Type : SA Calculator : None
Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2.5

Question Label : Short Answer Question

$\delta = R_1 + \gamma \times 0 - 0$

$= 10$

Find the TD error for this transition.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

10

Question Number : 231 Question Id : 640653614215 Question Type : SA Calculator : None
Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Short Answer Question

Find the sum of the components of the vector $\mathbf{w}_1$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

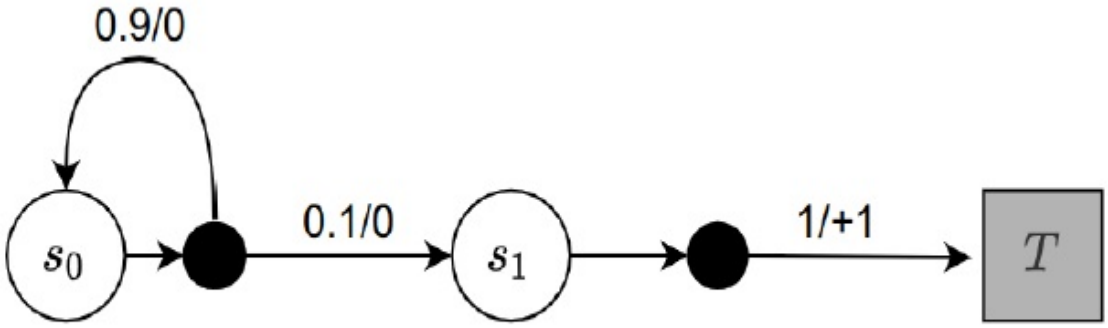
Sub-Section Number :	8
Sub-Section Id :	64065388840
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653614216 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (232 to 233)

Question Label : Comprehension

Consider following MDP, assume $\lambda = 0.9, \gamma = 1$:



The edges have the value p/r, where p denotes the transition probability and r is the immediate expected reward. s_0, s_1 are non-terminal states and T is a terminal state.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 232 Question Id : 640653614217 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3.5

Question Label : Short Answer Question

What is the probability that the accumulating eligibility trace for state s_0 is more than 3 at the end of a trajectory?

$(0.9)^3$

Response Type : Numeric

Evaluation Required For SA : Yes

0.729

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.71 to 0.74

Question Number : 233 Question Id : 640653614218 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1.5

Question Label : Multiple Choice Question

If the eligibility traces are replacing in nature, which state would have highest eligibility trace at the end of a trajectory, and what will be the value of the eligibility trace of the corresponding state?

Options :

6406532050536. ✖ State with highest eligibility trace = s_0 and $e(s_0) = 1$

6406532050537. ✔ State with highest eligibility trace = s_1 and $e(s_1) = 1$

6406532050538. ✖ State with highest eligibility trace = s_0 and $e(s_0) = 0.9$

6406532050539. ✖ State with highest eligibility trace = s_1 and $e(s_1) = 0.9$

Statistical Computing

Section Id :	64065341419
Section Number :	11
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	6
Number of Questions to be attempted :	6
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065388841
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 234 Question Id : 640653614219 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DEGREE LEVEL : STATISTICAL COMPUTING (PEN AND PAPER EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406532050540. ✔ YES

6406532050541. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	64065388842
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 235 Question Id : 640653614220 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

Use the following PDFs and PMFs if required:

- $X \sim \text{Geometric}(p),\ P(X = k) = (1-p)^{k-1}p,\ \text{for } k = 1, \ldots, \infty$
- $X \sim \text{Geometric}(p),\ P(X = k) = (1-p)^{k}p,\ \text{for } k = 0, 1, \ldots, \infty$
- $X \sim \text{Uniform}[a, b],\ f_X(x) = \dfrac{1}{b-a},\ \text{for } a \leq x \leq b$
- $X \sim \text{Exp}(\lambda),\ f_X(x) = \lambda e^{-\lambda x},\ x > 0$
- $X \sim \text{Normal}(\mu, \sigma^2),\ f_X(x) = \dfrac{1}{\sigma\sqrt{2\pi}} \exp\left(\dfrac{-(x-\mu)^2}{2\sigma^2}\right),\ \text{for } -\infty < x < \infty$
- $X \sim \text{Gamma}(\alpha, \beta),\ f_X(x) = \dfrac{\beta^{\alpha}}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}, x > 0, \alpha, \beta > 0.$
- $X \sim \text{Beta}(\alpha, \beta),\ f_X(x) = \dfrac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1}(1-x)^{\beta-1}, 0 < x < 1, \alpha, \beta > 0.$
- $X \sim \text{Cauchy}(\mu, \lambda), f_X(x) = \dfrac{1}{\pi}\left[\dfrac{\lambda}{\lambda^2 + (x-\mu)^2}\right], \lambda > 0, x, \mu \in \mathbb{R}$

Options :

6406532050542. ✔ Useful Data has been mentioned above.

6406532050543. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number :	3
Sub-Section Id :	64065388843
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 236 Question Id : 640653614221 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 30

Question Label : Multiple Choice Question

1. Let $X_1, X_2, \ldots, X_n \sim$ iid F, where F is a 2-component Exponential(λ) mixture distribution with density

$$f(x \mid \lambda_1, \lambda_2, \pi_1, \pi_2) = \pi_1 f_1(x \mid \lambda_1) + \pi_2 f_2(x \mid \lambda_2),$$

where $\lambda_1, \lambda_2 \geq 0$ and $\pi_1, \pi_2 \in (0,1), \pi_1 + \pi_2 = 1$. Suppose we want to obtain the maximum likelihood estimate of $\theta = (\pi_1, \pi_2, \lambda_1, \lambda_2)$ using the EM algorithm.

(i) Recall that the E-step has the function:

$$Q(\theta \mid \theta_{(k)}) = E[\log f(x, z \mid \theta) \mid X = x, \theta = \theta_{(k)}]$$

Simplify this expression for the given likelihood. [6 marks]

(ii) M-step:

(a) Show that $\lambda_{c,(k+1)} = \dfrac{\sum_{i=1}^{n} \gamma_{i,c,(k)}}{\sum_{i=1}^{n} x_i \gamma_{i,c,(k)}}$. [3 marks]

(b) Show that $\pi_{c,(k+1)} = \dfrac{\sum_{i=1}^{n} \gamma_{i,c,(k)}}{n}$. [3 marks]

(c) Show that $\lambda_{c,(k+1)}, \pi_{c,(k+1)}$ is the maxima of $q(\lambda, \pi \mid \lambda_{(k)}, \pi_{(k)})$. [2 marks]

,where $\gamma_{i,c,(k)} = \dfrac{f_c(x_i \mid \lambda_{c,(k)})\pi_{c,(k)}}{\sum_{j=1}^{c} f_j(x_i \mid \lambda_{j,(k)})\pi_{j,(k)}}$

(iii) Write the steps of the EM algorithm for the 2-component Exponential(λ) mixture distribution. [2 marks]

2. Consider a random variable X with the following cumulative distribution function:

$$F(x) = \frac{x^2 + x}{2}, \quad 0 \leq x \leq 1$$

(a) Write down the steps of the Inverse transform method to sample from the given distribution. [3 marks]

(b) Write down the steps for the Accept-reject to sample from this distribution. [7marks]

3. Suppose we want to estimate $\Pr(-1 < X < 1)$, where $X \sim \text{Normal}(0,1)$ using the weighted importance sampling method. Let the importance proposal density be

$$g(x) = \frac{3x^2}{2}, \quad x \in [-1,1]$$

If $\Pr(-1 < X < 1) = 2E_G\left(\frac{f(x)\tilde{f}(x)}{g(x)}\right)$, then find $\tilde{f}(x)$, where G denotes the distribution of $g(x)$. [4 marks]

Options :

6406532050544. ✔ I have written answers on the answer sheets

6406532050545. ✖ Not applicable

Sub-Section Number : 4

Sub-Section Id : 64065388844

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 237 Question Id : 640653614222 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 8

Question Label : Multiple Choice Question

4. Suppose we want to sample uniformly from a circle centered at 0 and radius 4 using the below proposal density:

$$g(x,y) = \frac{1}{4m^2}\mathbb{I}(-m < x < m)\mathbb{I}(-m < y < m)$$

For what values of m, will an accept reject algorithm be correct? Select all that apply. [4 marks]

(a) $m = 1$

(b) $m = 4$

(c) $m = 3$

(d) $m = 10$

5. Which among the following distributions can be sampled using the Ratio-of-Uniform method? [4 marks]

(a) Beta $(0.5, 0.5)$

(b) Standard Cauchy distribution

(c) $f(x) = xe^{-1/x}, x > 0$

(d) $f(x) = \frac{1}{x^2}, x \geq 1$

Options :

6406532050546. ✔ I have written answers on the answer sheets

6406532050547. ✖ Not applicable

Sub-Section Number : 5

Sub-Section Id : 64065388845

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 238 Question Id : 640653614223 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 6

Question Label : Multiple Choice Question

6. Which among the following is true for an MM algorithm when applied to a minimization problem? [3 marks]

(a) MM algorithm finds a majoring function and then minimize it at each iterate.

(b) The algorithm is always guaranteed to converge to a global minima.

(c) The algorithm always has the ascent property.

(d) None of the above.

7. The optimal simple importance sampling proposal distribution for estimating the kth moment of a Gamma (α, β) distribution is Gamma$(\alpha + k, \beta)$. What is the variance of the resulting importance sampling estimator? [3 marks]

(a) zero

(b) α/β^2

(c) $(\alpha + k)/\beta^2$

Options :

6406532050548. ✔ I have written answers on the answer sheets

6406532050549. ✖ Not applicable

Sub-Section Number :	6
Sub-Section Id :	64065388846
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 239 Question Id : 640653614224 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 6

Question Label : Multiple Choice Question

8. The below code runs an optimization procedure.

```
generate <- function(n, mu) {
  sequence <- runif(n)
  return(tan(pi*(sequence - 0.5)) + mu)
}

objective <- function(mu, X)
{
  n <- length(X)
  rtn <- -n*log(pi) - sum(log(1 + (X - mu)^2))
  return(rtn)
}

# Function that implements the optimization
objectivefunc <- function(X, steps = 1000, tol = 1e-5, jump = 0.002)
{
  current <- 20
  diff <- 100
  iter <- 0
  while( (diff > tol) && iter < steps)
  {
    iter <- iter + 1
    update <- current + jump*sum(2*(X - current)/(1 + (X-current)^2))
    diff <- abs(current - update)
    current <- update
  }
  return(list("iter" = iter, "approx" = current))

  }


  X <- generate(1000, 10)
  output <- objectivefunc(X)

  output$approx
  [1] 9.994792
```

Study the code carefully and answer the below questions:

(i) Select the optimization procedure that is being implemented here. [3 marks]

(a) Newton Raphson
(b) Gradient ascent
(c) MM algorithm
(d) EM algorithm

(ii) What does `output$approx` represent here? Comment. [3 marks]

Options :

6406532050550. ✔ I have written answers on the answer sheets

6406532050551. ✖ Not applicable

Advanced Algorithms

Section Id :	64065341420
Section Number :	12
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	21
Number of Questions to be attempted :	21
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065388847
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 240 Question Id : 640653614225 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DEGREE LEVEL : ADVANCED ALGORITHMS (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS

REGISTERED BY YOU)

Options :

6406532050552. ✔ YES

6406532050553. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	64065388848
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 241 Question Id : 640653614226 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question