✔ **Congratulations! You passed!**

✔ 1 / 1 point

1.
Select correct statements

☐ One can obtain sample from gaussian distribution using one sample from uniform

Un-selected is correct

☐ One can obtain n multivariate gaussian samples $x \in \mathbb{R}^n$ from n standard 1d gaussian samples.

Un-selected is correct

☑ One can obtain sample from exponential distribution using one sample from uniform

Correct
Correct: If $X \sim \mathcal{F}$ is a random variable with CDF $F(x)$ that can be inverted analytically then $F^{-1}(u) \sim \mathcal{F}$ where $u \sim \mathrm{U}[0,1]$. Correspondingly $-\frac{\log u}{\lambda} \sim Exp(\lambda)$.

☑ One can obtain multivariate gaussian sample $x \in \mathbb{R}^n$ from n standard 1d gaussian samples

Correct
Correct: any multivariate gaussian $X \sim \mathcal{N}(\mu, \Sigma)$ can be represented as $\mu + \Sigma^{1/2}\epsilon$, where $\epsilon \sim \mathcal{N}(0, \mathrm{I})$.

✔ 1 / 1 point

2.
What is a time complexity of an algorithm for sampling a random number from an arbitrary discrete distribution with support $\{1, \ldots, N\}$

◉ O(N)

Correct
Correct: prior to sampling we need to compute cumulative sums which is O(N) operations.

○ O(1)

○ O(log N)

✓ 1 / 1
point

3.
What we can use Monte-Carlo method for?

☑ Compute an integral of an arbitrary function over a simple area (e.g. a multidimensonal cube)

Correct
Correct: just sample random points uniformly in the area and average the function values in those points. Note that usually this is not the best approach, although very scalable.

☐ Compute the exact mode of a posterior distribution (MAP-estimation)

Un-selected is correct

☑ Do full bayesian inference to estimate the uncertainty of you model.

Correct
Correct: see example in the lecture.

☑ Estimate the expected values of arbitrary random variables

Correct
Correct: this is what Monte-Carlo method is for.

✓ 1 / 1
point

4.
Which of the statements below are correct?

☐ Any Markov chain converges to a stationary distribution

Un-selected is correct

☑ Markov chain does not "remember" states other than current

Correct
Correct.

☐ Any sequence of random variables $X_n : n \in \mathbb{N}$ can be considered as a Markov chain.

Un-selected is correct

☐ All elements X_n of a Markov chain $X_n : n \in \mathbb{N}$ are independent random variables.

← **Markov Chain Monte Carlo**
Quiz, 10 questions

Un-selected is correct

☐ Any Markov chain is a sequence of discrete random variables, for example: $\{0, 1, 0, 0, 1, 0, 0, \dots\}$.

▲

Un-selected is correct

✔ 1 / 1
point

5.
Which of the statements below are correct?

☑ MCMC techniques are used when ones cannot perform bayesian inference analytically

▲

Correct
Correct.

☐ MCMC provides i.i.d. samples from desired distribution

▲

Un-selected is correct

☑ MCMC can be used to sample from the distribution known up to a normalization constant

▲

Correct
Correct.

✔ 1 / 1
point

6.
Which of the statements below are correct?

☑ Gibbs sampling reduces multidimensional sampling to one-dimensional sampling.

▲

Correct
Correct.

☐ Gibbs sampling converges really fast because it provides very uncorrelated samples compared to Metropolis-Hastings algorithm
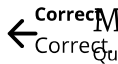
▲

Un-selected is correct

☑ Each iteration of Gibbs sampling changes only one coordinate of a latent vector

▲

☑ Gibbs sampling is a special case of a Metropolis-Hastings algorithm.

▲

Correct
Correct. Gibbs sampling is a special case of MH with acceptance rate equal to 1.

✔ 1 / 1
point

7.
Which of the following is random in Bayesian Neural Networks?

☑ Weights of the network w

▲

Correct
Correct

☑ Prediction of the network y given fixed input x

▲

Correct
Correct. Prediction of the network y depends on the weights which are random variables.

☐ Number of units on each layer of the network

▲

Un-selected is correct

☐ Number of active layers of the network

▲

Un-selected is correct

✔ 1 / 1
point

8.
What is a good way to train (find the posterior distribution $p(w|D)$) Bayesian Neural Network?

○ Iteratively sample each weight from the conditional distribution given all other weights and the data.

◉ Run the stochastic gradient descent perturbing all network weights with independent Gaussian noise after each iteration.

▲

Correct
Correct. This algorithm is called Langevin Monte Carlo and is proved to converge to the true posterior.

✓ 1 / 1 point

9.

What does the word "Collapsed" means in the Collapsed Gibbs Sampling algorithm?

○ It means that we train the model on the subsample of the original data.

◉ It means that posterior distribution over some of the variables is computed analytically, while other variables are sampled using Gibbs Sampling.

▲

Correct
Correct

○ It means that the posterior approximation *collapses* to the are posterior distribution.

✓ 1 / 1 point

10.

Which of the variables are randomly sampled in Collapsed Gibbs Sampling for LDA?

◉ Z

▲

Correct
Correct. Everything else can be computed analytically.

○ Φ, Θ

○ Φ, Θ, Z

○ Φ