**Mandsaur University, Mandsaur**

**Department of Computer Science & Engineering**

### **Subject: Deep Learning**

**Assignment 5**

**Q1. (Generative Adversarial Network – GAN Application)**  
You are asked to build a **GAN model** to generate handwritten digit images similar to the MNIST dataset.

**Tasks:**  
a) Describe the roles of the **Generator** and **Discriminator** networks in this setup.  
b) If the input to the Generator is a random noise vector of size 100, and the output should be a **28×28 grayscale image**, explain the network design briefly.  
c) Implement a minimal PyTorch/TensorFlow code snippet for the **Generator network**.

**OR**

**(Reinforcement Learning with MDP)**  
Consider a **Gridworld environment** where an agent has to reach the goal state from a starting position. The environment is modeled as a **Markov Decision Process (MDP)** with:

* States = 16 (4×4 grid)
* Actions = {Up, Down, Left, Right}
* Rewards = +1 for reaching goal, -1 for falling into a trap, 0 otherwise

**Tasks:**  
a) Define the components of this MDP: (S, A, P, R, γ).  
b) Explain how **Q-learning** can be used to solve this task.  
c) Discuss one **challenge of reinforcement learning** (e.g., exploration vs. exploitation) in this scenario.