Design a Train Ticket Booking System

Consider a scenario where passengers need to book train tickets for a one-way journey or a return journey. Design a Python program using Object-Oriented Programming (OOP) principles to implement a Train Ticket Booking System. The system should allow users to perform the following tasks:

1. Book One-Way Ticket:
   - Passengers should be able to select the source and destination stations.
   - Display available trains between the selected stations.
   - Allow passengers to choose a train, enter the date of the journey, and select the coach type (Sleeper/3AC/2AC/1AC). Prices will vary according to the coach type.
   - Generate a ticket with an automatically generated PNR number.
   - Display the passenger's name, train details, journey date, coach type, PNR, and ticket price.
2. Get Trip Info:
   - Passengers should be able to retrieve information about their booked trip using the PNR number.
   - Display the train details, source, and destination of the booked trip.
3. Book Return Journey:
   - If a passenger has booked a one-way ticket, provide an option to book a return journey.
   - Automatically swap the source and destination stations for the return journey.
   - Display available trains for the return journey.
   - Allow passengers to choose a return train, enter the return date, and select the coach type.
   - Generate a return ticket with a new PNR number.
4. Print Ticket (PDF):
   - Provide an option to print the booked ticket in PDF format.
   - The PDF should include the passenger's name, train details, journey date, coach type, PNR, and ticket price.
5. Exit:
   - Allow users to exit the program.

Requirements:

- Implement the system using Python and Object-Oriented Programming (OOP) principles.
- Use classes such as Train, Passenger, Ticket, TripManager, and PDFGenerator to organize the code logically.
- Ensure proper error handling for invalid inputs (e.g., invalid PNR, selecting non-existent trains).
- Include sample data for at least four trains with different routes and coach prices.
- Write a Python program that fulfills the requirements mentioned above. Include comments to explain the logic and structure of your code. Test your program with various scenarios to ensure its correctness.

1. Train Class:

- The Train class represents a train with attributes such as name, source station, destination station, and coach prices.
- Initialize the class with the train details and a dictionary of coach prices where the keys are coach types (Sleeper/3AC/2AC/1AC) and values are corresponding prices.

2. Passenger Class:

- The Passenger class represents a passenger with attributes such as name and a reference to a booked ticket.
- Include a method book_ticket that takes a Train object, journey date, and coach type as parameters and returns a Ticket object.
- Implement a method to generate a random PNR number for each passenger.

3. Ticket Class:

- The Ticket class represents a booked ticket with attributes such as the associated train, journey date, coach type, and PNR.
- Include a list to store passengers associated with the ticket.
- Optionally, include a method to calculate the ticket price based on the selected train and coach type.

4. TripManager Class:

- The TripManager class manages the overall functionality of the Train Ticket Booking System.
- Include a method to get available trains between source and destination stations.
- Implement a method to retrieve trip information based on a given PNR.
- Include a method to swap source and destination stations for the return journey.

5. PDFGenerator Class:

- The PDFGenerator class is responsible for generating PDFs for booked tickets.
- Include a method to generate a PDF for a given passenger and trip manager, displaying relevant ticket information.