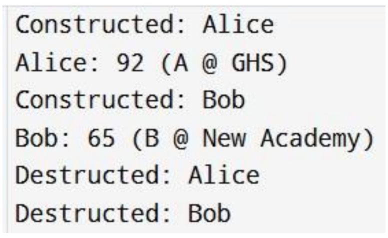
Name: Sonali Shinter
Roll No: C-29
Cource No:SPP II(Python)

Experiment No :9

Title:Write Python programs to create and use classes,constructors, and destructors.

1. Student Class: Create a class Student with name and marks. Include methods to display details, change school name (class method), calculate grade (static method), and a destructor message.

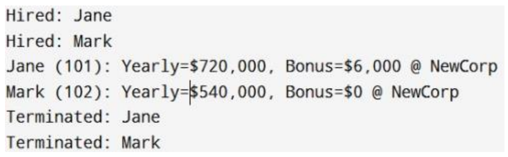
```
class Student: school = "GHS" def __init__(self, name,
marks): self.name, self.marks = name, marks
print(f"Constructed: {name}")
@classmethoddef change_school(cls, n): cls.school = n
@staticmethod
def get_grade(m): return 'A' if m >= 90 else 'B' def
show(self):
print(f"{self.name}: {self.marks} ({self.get_grade(self.marks)} @ {Student.school})")
def __del__(self): print(f"Destructed: {self.name}")
s1 = Student("Alice", 92)
s1.show(); Student.change_school("New Academy")
s2 = Student("Bob", 65) s2.show()
```



```
Constructed: Alice
Alice: 92 (A @ GHS)
Constructed: Bob
Bob: 65 (B @ New Academy)
Destructed: Alice
Destructed: Bob
```

2. Employee Salary: Create a class Employee with emp_id, name, and salary. Include methods to calculate yearly salary, update company name (class method), calculate bonus (static method), and destructor message.

```
class Employee: company = "TechCo" def __init__(self, i, n, s): self.id, self.name, self.salary = i, n, s
print(f"Hired: {n}")
@classmethod
def update_company(cls, new_c): cls.company = new_c
@staticmethoddef calculate_bonus(s): return s * 0.10 if s >
50000 else 0 def show_details(self): y = self.salary * 12; b =
Employee.calculate_bonus(self.salary)
print(f"{self.name} ({self.id}): Yearly=${y:,.0f}, Bonus=${b:,.0f} @ {Employee.company}") def
__del__(self): print(f"Terminated: {self.name}")
# Demonstration (All on three lines)
e1 = Employee(101, "Jane", 60000); e2 = Employee(102, "Mark", 45000)
Employee.update_company("NewCorp")
e1.show_details(); e2.show_details(); del e1
```



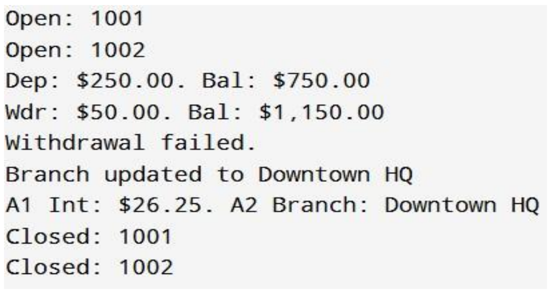
```
Hired: Jane
Hired: Mark
Jane (101): Yearly=$720,000, Bonus=$6,000 @ NewCorp
Mark (102): Yearly=$540,000, Bonus=$0 @ NewCorp
Terminated: Jane
Terminated: Mark
```

3. Bank Account: Create a class BankAccount with acc_no and balance. Include methods for deposit/withdrawal, update bank branch (class method),calculate interest (static method), and destructor message. class BankAccount: branch = "Main St" def __init__(self, acc, bal=0.0):

```
self.acc_no, self.balance = acc, bal; print(f"Open: {acc}") def deposit(self, amt): if amt > 0:
self.balance += amt; print(f"Dep: ${amt:,.2f}. Bal: ${self.balance:,.2f}") else: print("Deposit failed.")
def withdraw(self, amt): if 0 < amt <= self.balance: self.balance -= amt; print(f"Wdr: ${amt:,.2f}. Bal:
${self.balance:,.2f}") else: print("Withdrawal failed.")
@classmethod
```

Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

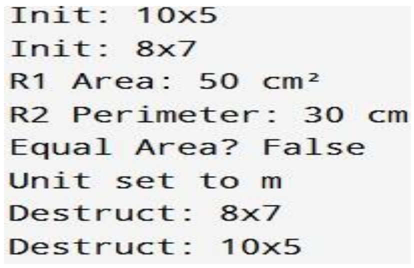
```
def update_bank_branch(cls, new_b): cls.branch = new_b; print(f"Branch updated to {new_b}")
@staticmethod
def calculate_interest(p, r=0.035): return p * r def __del__(self):
print(f"Closed: {self.acc_no}")
# Demonstration a1 = BankAccount(1001, 500); a2 =
BankAccount(1002, 1200) a1.deposit(250); a2.withdraw(50);
a1.withdraw(900) # Fails due to insufficient funds
BankAccount.update_bank_branch("Downtown HQ")
print(f"A1 Int: ${BankAccount.calculate_interest(a1.balance):,.2f}.
A2 Branch: {a2.branch}") del a1
```



```
Open: 1001
Open: 1002
Dep: $250.00. Bal: $750.00
Wdr: $50.00. Bal: $1,150.00
Withdrawal failed.
Branch updated to Downtown HQ
A1 Int: $26.25. A2 Branch: Downtown HQ
Closed: 1001
Closed: 1002
```

4. Rectangle Operations: Create a class Rectangle with length and width. Include methods to calculate area/perimeter, update unit (class method), compare two rectangles (static method), and destructor message.

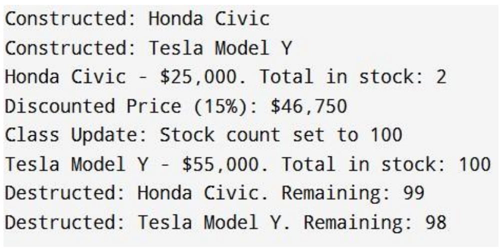
```
class Rectangle:
unit = "cm" def __init__(self, l, w): self.length, self.width = l, w;
print(f"Init:
{l}x{w}")
def calculate_area(self): return self.length * self.width
def calculate_perimeter(self): return 2 * (self.length + self.width)
@classmethod
def update_unit(cls, new_unit): cls.unit = new_unit; print(f"Unit set to {new_unit}")
@staticmethod
def compare_rectangles(r1, r2): return r1.calculate_area() == r2.calculate_area()
def __del__(self): print(f"Destruct: {self.length}x{self.width}") r1 =
Rectangle(10, 5); r2 = Rectangle(8, 7) print(f"R1 Area:
{r1.calculate_area()} {Rectangle.unit}²") print(f"R2 Perimeter:
{r2.calculate_perimeter()} {Rectangle.unit}") print(f"Equal Area?
{Rectangle.compare_rectangles(r1, r2)}")
Rectangle.update_unit("m")
del r2
```



```
Init: 10x5
Init: 8x7
R1 Area: 50 cm²
R2 Perimeter: 30 cm
Equal Area? False
Unit set to m
Destruct: 8x7
Destruct: 10x5
```

5. Car Information: Create a class Car with brand, model, and price. Includemethods to display details, update total cars (class method), calculatediscounted price (static method), and destructor message.

```
class Car: total_cars = 0 def __init__(self, b, m, p): self.brand, self.model,
self.price = b, m, p Car.total_cars += 1 print(f"Constructed: {b} {m}") def display_details(self):
print(f"{self.brand} {self.model} - ${self.price:,.0f}. Total in stock: {Car.total_cars}")
@classmethod
def update_total_cars(cls, count): cls.total_cars =
count
print(f"Class Update: Stock count set to {count}")
@staticmethod def
calculate_discounted_price(price, discount):
return price * (1 - discount) def __del__(self):
Car.total_cars -= 1
print(f"Destructed: {self.brand} {self.model}. Remaining: {Car.total_cars}")
```

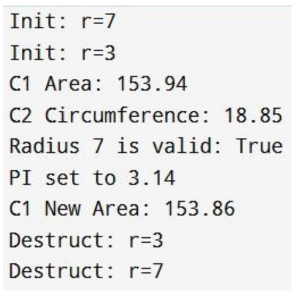


```
Constructed: Honda Civic
Constructed: Tesla Model Y
Honda Civic - $25,000. Total in stock: 2
Discounted Price (15%): $46,750
Class Update: Stock count set to 100
Tesla Model Y - $55,000. Total in stock: 100
Destructed: Honda Civic. Remaining: 99
Destructed: Tesla Model Y. Remaining: 98
```

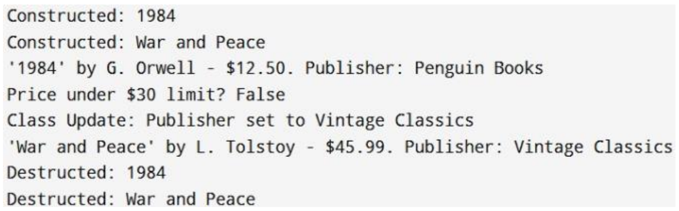
Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

# Demonstration
c1 = Car("Honda", "Civic", 25000); c2 = Car("Tesla", "Model Y", 55000) c1.display_details()
print(f"Discounted Price (15%): ${Car.calculate_discounted_price(c2.price, 0.15):,.0f}")
Car.update_total_cars(100)
c2.display_details() del c1

6. Circle Calculations: Create a class Circle with radius. Include methods to calculate area/circumference, update π value (class method), validate radius (static method), and destructor message. class Circle: PI = 3.14159
def __init__(self, r): self.radius = r; print(f"Init: r={r}") def area(self): return self.PI * self.radius ** 2 def circumference(self): return 2 * self.PI * self.radius
@classmethod
def update_pi(cls, p): cls.PI = p; print(f"PI set to {p}")
@staticmethod
def validate_radius(r): return r > 0
def __del__(self): print(f"Destruct: r={self.radius}")
c1 = Circle(7); c2 = Circle(3) print(f"C1 Area: {c1.area():.2f}") print(f"C2 Circumference: {c2.circumference():.2f}") print(f"Radius 7 is valid: {Circle.validate_radius(7)}") Circle.update_pi(3.14)
print(f"C1 New Area: {c1.area():.2f}")del c2


```
Init: r=7
Init: r=3
C1 Area: 153.94
C2 Circumference: 18.85
Radius 7 is valid: True
PI set to 3.14
C1 New Area: 153.86
Destruct: r=3
Destruct: r=7
```

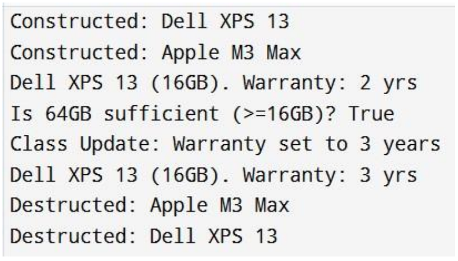
7. Book Details: Create a class Book with title, author, and price. Include methods to display details, update publisher (class method), check price limit (static method), and destructor message. class Book: publisher = "Penguin Books"
def __init__(self, t, a, p): self.title, self.author, self.price = t, a, p; print(f"Constructed: {t}")
def display_details(self): print(f"'{self.title}' by {self.author} - ${self.price:.2f}. Publisher: {Book.publisher}")
@classmethod
def update_publisher(cls, new_pub): cls.publisher = new_pub; print(f"Class Update: Publisher set to {new_pub}")
@staticmethod
def check_price_limit(price, limit=30.0): return price < limit
def __del__(self): print(f"Destructed: {self.title}") b1 = Book("1984", "G. Orwell", 12.50) b2 = Book("War and Peace", "L. Tolstoy", 45.99) b1.display_details()
print(f"Price under $30 limit? {Book.check_price_limit(b2.price)}")
Book.update_publisher("Vintage Classics")
b2.display_details() del
b1


```
Constructed: 1984
Constructed: War and Peace
'1984' by G. Orwell - $12.50. Publisher: Penguin Books
Price under $30 limit? False
Class Update: Publisher set to Vintage Classics
'War and Peace' by L. Tolstoy - $45.99. Publisher: Vintage Classics
Destructed: 1984
Destructed: War and Peace
```

Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

8. Laptop Specifications: Create a class Laptop with brand, model, and ram. Include methods to display specs, update warranty (class method), check RAM sufficiency (static method), and destructor message. class

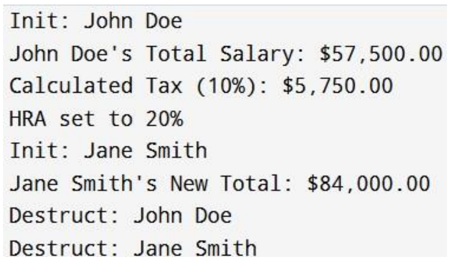
```
Laptop:
warranty_years = 2
def __init__(self, b, m, r): self.brand, self.model, self.ram = b, m, r;
print(f"Constructed: {b} {m}") def display_specs(self):
print(f"{self.brand} {self.model}
({self.ram}GB). Warranty: {Laptop.warranty_years} yrs")
@classmethod
def update_warranty(cls, years): cls.warranty_years = years; print(f"Class Update: Warranty set to {years}
years")
@staticmethod def check_ram_sufficiency(ram_gb): return
ram_gb >= 16 def __del__(self): print(f"Destructed: {self.brand}
{self.model}")
# Demonstration
l1 = Laptop("Dell", "XPS 13", 16) l2
= Laptop("Apple", "M3 Max", 64)
l1.display_specs()
print(f"Is {l2.ram}GB sufficient (>=16GB)? {Laptop.check_ram_sufficiency(l2.ram)}")
Laptop.update_warranty(3)
l1.display_specs() del l2
```



```
Constructed: Dell XPS 13
Constructed: Apple M3 Max
Dell XPS 13 (16GB). Warranty: 2 yrs
Is 64GB sufficient (>=16GB)? True
Class Update: Warranty set to 3 years
Dell XPS 13 (16GB). Warranty: 3 yrs
Destructed: Apple M3 Max
Destructed: Dell XPS 13
```

9. Payroll System: Create a class Payroll with name and basic_salary.Include methods to calculate total salary,update HRA percentage (class method),calculate tax (static method),and destructor message.

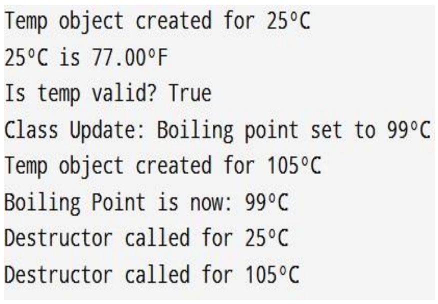
```
class Payroll:
HRA_percent = 0.15 # Default HRA is 15% of basic salary def __init__(self, n, s): self.name,
self.basic_salary = n, s; print(f"Init: {n}")
def total_salary(self): return self.basic_salary * (1 +
Payroll.HRA_percent) @classmethod
def update_hra(cls, p): cls.HRA_percent = p; print(f"HRA set to
{p*100:.0f}%") @staticmethod
def calculate_tax(salary, rate=0.10): return salary * rate def
__del__(self): print(f"Destruct: {self.name}")
# Demonstration p1 =
Payroll("John Doe", 50000) ts =
p1.total_salary()
print(f"{p1.name}'s Total Salary: ${ts:,.2f}")
print(f"Calculated Tax (10%): ${Payroll.calculate_tax(ts):,.2f}")
Payroll.update_hra(0.20) p2 = Payroll("Jane Smith", 70000)
print(f"{p2.name}'s New Total: ${p2.total_salary():,.2f}") del
p1
```



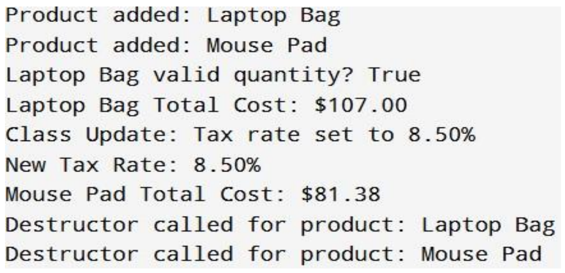
```
Init: John Doe
John Doe's Total Salary: $57,500.00
Calculated Tax (10%): $5,750.00
HRA set to 20%
Init: Jane Smith
Jane Smith's New Total: $84,000.00
Destruct: John Doe
Destruct: Jane Smith
```

Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

10. Temperature Converter: Create a class Temperature with a Celsius value. Include methods to convert to Fahrenheit, set boiling point (class method), validate temperature (static method), and destructor message. class
Temperature: BOILING_POINT = 100
def __init__(self, c): self.celsius = c; print(f"Temp object created for {c}°C")
def to_fahrenheit(self): return (self.celsius * 9/5) + 32
@classmethod
def set_boiling_point(cls, bp): cls.BOILING_POINT = bp; print(f"Class Update: Boiling point set to {bp}°C")
@staticmethod
def validate_temp(celsius): return celsius >= -273.15 # Absolute zero
def __del__(self): print(f"Destructor called for {self.celsius}°C")
# Demonstration t1
= Temperature(25)
print(f"25°C is {t1.to_fahrenheit():.2f}°F")
print(f"Is temp valid? {Temperature.validate_temp(t1.celsius)}")
Temperature.set_boiling_point(99) t2
= Temperature(105)
print(f"Boiling Point is now: {Temperature.BOILING_POINT}°C") del
t1


```
Temp object created for 25°C
25°C is 77.00°F
Is temp valid? True
Class Update: Boiling point set to 99°C
Temp object created for 105°C
Boiling Point is now: 99°C
Destructor called for 25°C
Destructor called for 105°C
```

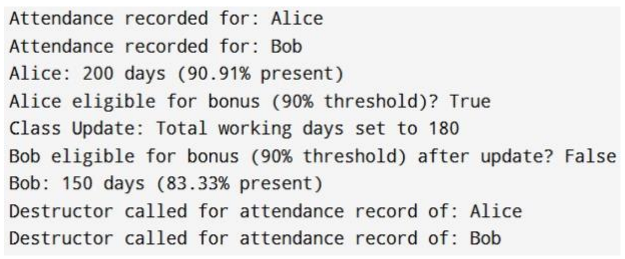
11. Product Management: Create a class Product with name, price, and quantity. Include methods to calculate total cost, update tax rate (class method), validate quantity (static method), and destructor message.
class Product:
TAX_RATE = 0.07 # Default tax rate is 7% def __init__(self, n, p, q): self.name, self.price, self.quantity = n, p, q; print(f"Product added: {n}") def calculate_total_cost(self):
"""Calculates total cost including tax.""" subtotal
= self.price * self.quantity
return subtotal * (1 + Product.TAX_RATE)
@classmethod
def update_tax_rate(cls, rate): cls.TAX_RATE = rate; print(f"Class Update: Tax rate set to {rate*100:.2f}%")
@staticmethod
def validate_quantity(q): return q > 0 def __del__(self):
print(f"Destructor called for product:
{self.name}") # Demonstration p1 = Product("Laptop Bag", 50.00, 2) p2 = Product("Mouse Pad", 15.00, 5)
print(f"{p1.name} valid quantity?
{Product.validate_quantity(p1.quantity)}")
print(f"{p1.name} Total Cost:
${p1.calculate_total_cost():.2f}") Product.update_tax_rate(0.085) # Update tax to 8.5% print(f"New Tax Rate: {Product.TAX_RATE*100:.2f}%")
print(f"{p2.name} Total Cost: ${p2.calculate_total_cost():.2f}")
# Explicit destructor call del
p1


```
Product added: Laptop Bag
Product added: Mouse Pad
Laptop Bag valid quantity? True
Laptop Bag Total Cost: $107.00
Class Update: Tax rate set to 8.50%
New Tax Rate: 8.50%
Mouse Pad Total Cost: $81.38
Destructor called for product: Laptop Bag
Destructor called for product: Mouse Pad
```

Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

12. Employee Attendance: Create a class Attendance with emp_name and days_present. Include methods to display attendance, update total working days (class method), check bonus eligibility (static method), and destructor message. class Attendance:

```
TOTAL_WORKING_DAYS = 220 # Class variable for total days def __init__(self, n, p): self.emp_name,
self.days_present = n, p; print(f"Attendance recorded for: {n}") def display_attendance(self):
"""Displays attendance percentage.""" percent = (self.days_present /
Attendance.TOTAL_WORKING_DAYS) * 100 print(f"{self.emp_name}: {self.days_present} days
({percent:.2f}% present)")
@classmethod
def update_total_working_days(cls, days): cls.TOTAL_WORKING_DAYS = days; print(f"Class Update: Total
working days set to {days}")
@staticmethod def
check_bonus_eligibility(days_present, threshold=0.9):
"""Checks eligibility based on a threshold percentage."""
return (days_present / Attendance.TOTAL_WORKING_DAYS) >= threshold
def __del__(self): print(f"Destructor called for attendance record of: {self.emp_name}")
# Demonstration e1 = Attendance("Alice", 200) e2 = Attendance("Bob", 150) e1.display_attendance()
print(f"Alice eligible for bonus (90% threshold)?
```



```
Attendance recorded for: Alice
Attendance recorded for: Bob
Alice: 200 days (90.91% present)
Alice eligible for bonus (90% threshold)? True
Class Update: Total working days set to 180
Bob eligible for bonus (90% threshold) after update? False
Bob: 150 days (83.33% present)
Destructor called for attendance record of: Alice
Destructor called for attendance record of: Bob
```

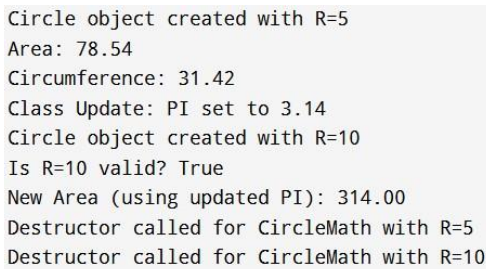
```
{Attendance.check_bonus_eligibility(e1.days_present)}") Attendance.update_total_working_days(180) #
Shorter period print(f"Bob eligible for bonus (90% threshold) after update?
{Attendance.check_bonus_eligibility(e2.days_present)}") e2.display_attendance()
del e1
```

13. CircleMath Operations: Create a class CircleMath with radius. Include methods to calculate area/circumference, update π (class method),

```
import math class
CircleMath: PI =
math.pi
def __init__(self, r): self.radius = r; print(f"Circle object created with R={r}") def
calculate_area(self): return self.PI * (self.radius ** 2)
def calculate_circumference(self): return 2 * self.PI * self.radius
@classmethod
def update_pi(cls, p): cls.PI = p; print(f"Class Update: PI set to {p}")
@staticmethod
def validate_radius(r): return r > 0
def __del__(self): print(f"Destructor called for CircleMath with R={self.radius}")
```

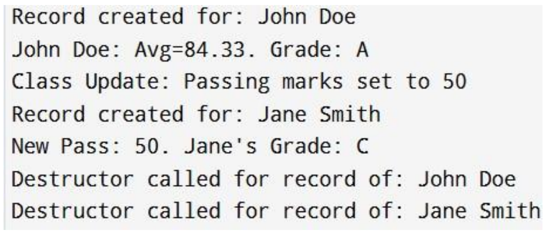
Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

# Demonstration c1 = CircleMath(5)
print(f"Area: {c1.calculate_area():.2f}")
print(f"Circumference: {c1.calculate_circumference():.2f}")
CircleMath.update_pi(3.14) c2 = CircleMath(10) print(f"Is R=10 valid?
{CircleMath.validate_radius(c2.radius)}")
print(f"New Area (using updated PI):
{c2.calculate_area():.2f}") del c1



```
Circle object created with R=5
Area: 78.54
Circumference: 31.42
Class Update: PI set to 3.14
Circle object created with R=10
Is R=10 valid? True
New Area (using updated PI): 314.00
Destructor called for CircleMath with R=5
Destructor called for CircleMath with R=10
```

14. Student Marks: Create a class StudentMarks with name and marks. Include methods to calculate total and average, update passing marks (class method), assign grade (static method), and destructor message. class StudentMarks:
PASSING_MARKS = 40 # Default passing mark per subject def __init__(self, n, m):
self.name, self.marks = n, m; print(f"Record created for: {n}") def total_avg(self):
"""Calculates total and average marks."""
total, avg = sum(self.marks), sum(self.marks) / len(self.marks) return
total, avg
@classmethod
def update_passing_marks(cls, marks): cls.PASSING_MARKS = marks; print(f"Class Update: Passing marks set to {marks}") @staticmethod def assign_grade(avg):
"""Assigns a letter grade based on average."""
return 'A+' if avg >= 90 else ('A' if avg >= 75 else ('B' if avg >= 60 else 'C')) def
__del__(self): print(f"Destructor called for record of: {self.name}")
# Demonstration
s1 = StudentMarks("John Doe", [85, 90, 78])
t, a = s1.total_avg() print(f"{s1.name}: Avg={a:.2f}. Grade:
{StudentMarks.assign_grade(a)}")
StudentMarks.update_passing_marks(50) # Update passing threshold
s2 = StudentMarks("Jane Smith", [45, 55, 60]) t,
a = s2.total_avg()
print(f"New Pass: {StudentMarks.PASSING_MARKS}. Jane's Grade: {StudentMarks.assign_grade(a)}") del
s1

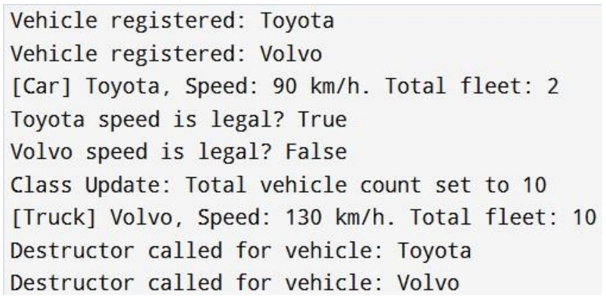


```
Record created for: John Doe
John Doe: Avg=84.33. Grade: A
Class Update: Passing marks set to 50
Record created for: Jane Smith
New Pass: 50. Jane's Grade: C
Destructor called for record of: John Doe
Destructor called for record of: Jane Smith
```

15. Vehicle Information: Create a class Vehicle with type, brand, and speed. Include methods to display details, update total vehicle count (class method), check legal speed (static method), and destructor message.
class Vehicle:
TOTAL_VEHICLES = 0
LEGAL_SPEED_LIMIT = 120 # Default limit in km/h

Name: Sonali Shintre
Roll No: C-29
Cource No:SPP II(Python)

def __init__(self, t, b, s): self.type, self.brand, self.speed = t, b, s; Vehicle.TOTAL_VEHICLES += 1; print(f"Vehicle registered: {b}") def display_details(self): print(f"[{self.type}] {self.brand}, Speed: {self.speed} km/h. Total fleet: {Vehicle.TOTAL_VEHICLES}")
@classmethod
def update_total_vehicle_count(cls, count): cls.TOTAL_VEHICLES = count; print(f"Class Update: Total vehicle count set to {count}")
@staticmethod def check_legal_speed(current_speed, limit=None): """Checks if the speed is below the legal limit."""
limit = limit if limit is not None else Vehicle.LEGAL_SPEED_LIMIT return current_speed <= limit
def __del__(self): Vehicle.TOTAL_VEHICLES -= 1; print(f"Destructor called for vehicle: {self.brand}")
# Demonstration
v1 = Vehicle("Car", "Toyota", 90) v2 = Vehicle("Truck", "Volvo", 130)
v1.display_details() print(f"Toyota speed is legal? {Vehicle.check_legal_speed(v1.speed)}") print(f"Volvo speed is legal? {Vehicle.check_legal_speed(v2.speed)}")
Vehicle.update_total_vehicle_count(10) # Update fleet size
v2.display_details() del v1



```
Vehicle registered: Toyota
Vehicle registered: Volvo
[Car] Toyota, Speed: 90 km/h. Total fleet: 2
Toyota speed is legal? True
Volvo speed is legal? False
Class Update: Total vehicle count set to 10
[Truck] Volvo, Speed: 130 km/h. Total fleet: 10
Destructor called for vehicle: Toyota
Destructor called for vehicle: Volvo
```