

Questions 9 to 11

For each of the following differential equations, select the option which describes the possible method or methods of solution, assuming that the necessary integrations can be performed.

C 9 $\frac{dy}{dx} = x(x+y)$

B 10 $\frac{dy}{dx} = xe^{(x+y)}$

A 11 $\frac{dy}{dx} = x \cos(x+y)$

Options for Questions 9 to 11

- A Neither the separation of variables method nor the integrating factor method
B The separation of variables method but not the integrating factor method
C The integrating factor method but not the separation of variables method
D Either the separation of variables method or the integrating factor method

Question 12

Select the option which gives an integrating factor for the linear differential equation

$$\frac{dy}{dx} = \sin x - y \cos x$$

Options

- A $\cos x$ B $-\cos x$ C $\sin x$ D $-\sin x$
E $e^{\cos x}$ F $e^{-\cos x}$ G $e^{\sin x}$ H $e^{-\sin x}$

Unit 3

Questions 13 and 14

A model of the way a population changes with time is constructed using the following assumptions.

- The number of births during each year is 25% of the population size at the start of the year.
- The number of deaths during each year is 15% of the population size at the start of the year.
- The number of immigrants each year is constant at 1000 per year.
- The number of emigrants during each year is 5% of the population at the start of the year.

- 13 Which one of the following options gives the recurrence relation for the population P_n at the start of the n th year?

Options

- A $P_{n+1} = 0.05P_n + 1000$ B $P_{n+1} = 0.05P_n - 1000$
C $P_{n+1} = 0.15P_n + 1000$ D $P_{n+1} = 0.15P_n - 1000$
E $P_{n+1} = 1.05P_n + 1000$ F $P_{n+1} = 1.05P_n - 1000$
G $P_{n+1} = 1.15P_n + 1000$ H $P_{n+1} = 1.15P_n - 1000$