

CBSE Class 12 Applied Mathematics 2022 - Set 465



Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 2 Hours

Maximum Marks: 40

General Instructions

- (i) This question paper contains three sections – Section A, B and C.
- (ii) Each section is compulsory.
- (iii) Section A has 6 short answer type-I questions of 2 marks each.
- (iv) Section B has 4 short answer type-II questions of 3 marks each.
- (v) Section C has 4 long answer type questions of 4 marks each.
- (vi) There is an internal choice in some questions.

Section A

1(a). Evaluate:

$$\int_0^1 \frac{xe^x}{(x+1)^2} dx$$

OR

1(b). Solve the following differential equation:

$$\frac{dy}{dx} = e^{x+y} + x^2 e^y$$

2. Find the present value of a perpetuity of ₹ 18,000 payable at the end of 6 months, if the money is worth 8% p.a. compounded semi-annually.

3(a). Find the effective rate which is equivalent to nominal rate of 10% p.a. compounded monthly.

[Given that: $(1.00833)^{12} = 1.1047$]

OR

3(b). Abhay bought a mobile phone for ₹ 30,000. The mobile phone is estimated to have a scrap value of ₹ 3,000 after a span of 3 years. Using the linear depreciation method, find the book value of the mobile phone at the end of 2 years.

4. Consider the following hypothesis:

$$H_0 : \mu = 35$$

$$H_1 : \mu \neq 35$$

A sample of 81 items is taken whose mean is 37.5 and the standard deviation is 5. Test the hypothesis at 5% level of significance.

[Given: Critical value of Z for a two-tailed test at 5% level of significance is 1.96]

5. The following table shows the annual rainfall (in mm) recorded for Cherrapunji, Meghalaya:

Year	Rainfall (in mm)
2001	1.2
2002	1.9
2003	2
2004	1.4
2005	2.1
2006	1.3
2007	1.8
2008	1.1
2009	1.3

Determine the trend of rainfall by 3-year moving average.

6. Maximize $z = 3x + 4y$, if possible, subject to the constraints:

$$x - y \leq -1$$

$$-x + y \leq 0$$

$$x, y \geq 0$$

Section B

7(a). The supply function of a commodity is $100p = (x + 20)^2$. Find the Producer's Surplus (PS), when the market price is ₹ 25.

OR

7(b). Find:

$$\int \frac{2x^2 + 1}{x^2 - 3x + 2} dx$$

8. Fit a straight line trend by the method of least squares and find the trend value for the year 2008 for the following data:

Year	Production (in lakh tonnes)
2001	30
2002	35
2003	36
2004	32
2005	37
2006	40
2007	36

9. Ten cartons are taken at random from an automatic packing machine. The mean net weight of the ten cartons is 11.8 kg and standard deviation is 0.15 kg. Does the sample mean differ significantly from the intended mean of 12 kg?

[Given that for d.f. = 9, $t_{0.05} = 2.26$]

10. Madhu exchanged her old car valued at ₹ 1,50,000 with a new one priced at ₹ 6,50,000. She paid ₹ x as down payment and the balance in 20 monthly equal instalments of ₹ 21,000 each. The rate of interest offered to her is 9% p.a. Find the value of x.

[Given that: $(1.0075)^{-20} = 0.86118985$]

Section C

11. In a certain culture of bacteria, the rate of increase of bacteria is proportional to the number present. It is found that there are 10,000 bacteria at the end of 3 hours and 40,000 bacteria at the end of 5 hours. Determine the number of bacteria present in the beginning.

12(a). Calculate the EMI under 'Flat Rate System' for a loan of ₹ 5,00,000 with 10% annual interest rate for 5 years.

OR

12(b). A machine costing ₹ 2,00,000 has effective life of 7 years and its scrap value is ₹ 30,000. What amount should the company put into a sinking fund earning 5% p.a., so that it can replace the machine after its usual life? Assume that a new machine will cost ₹ 3,00,000 after 7 years.

[Given that: $(1.05)^7 = 1.407$]

13. A start-up company invested ₹ 3,00,000 in shares for 5 years. The value of this investment was ₹ 3,50,000 at the end of second year, ₹ 3,80,000 at the end of third year and on maturity, the final value stood at ₹ 4,50,000. Calculate the Compound Annual Growth Rate (CAGR) on the investment.

[Given that: $(1.5)^{1/5} = 1.084$]

14. A dietician wishes to mix two types of foods F_1 and F_2 in such a way that the vitamin content of the mixture contains at least 8 units of vitamin A and 10 units of vitamin C. Food F_1 contains 2 units/kg of vitamin A and 1 unit/kg of vitamin C, while Food F_2 contains 1 unit/kg of vitamin A and 2 units/kg of vitamin C. It costs ₹ 5 per kg to purchase Food F_1 and ₹ 7 per kg to purchase Food F_2 .

Based on the above information, answer the following questions:

- (a) To find out the minimum cost of such a mixture, formulate the above problem as a LPP.
- (b) Determine the minimum cost of the mixture.

- End of Question Paper -