

CBSE Class 12 Applied Mathematics 2022 - Set 465 - Compartment



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: A, B and C. Each section is compulsory.
- (ii) Section A has 6 short answer type-I questions of 2 marks each.
- (iii) Section B has 4 short answer type-II questions of 3 marks each.
- (iv) Section C has 4 long answer questions of 4 marks each.
- (v) There is an internal choice in some questions.

Section A

1. A man wants to deposit a lumpsum amount so that an annual scholarship of ₹ 3,000 is paid. Rate of interest is 5% p.a. Calculate the lumpsum amount required, if the scholarship is to start in the beginning of each year and continue forever.

2(a). If the marginal revenue function for output x is given by $MR = \frac{6}{(x+2)^2} + 5$, find the total revenue function.

OR

2(b). Evaluate:

$$\int_0^4 |x-2| dx$$

3(a). A man borrows ₹ 3,00,000 at 6% per annum compound interest and promises to pay off the debt in 20 annual instalments beginning at the end of the first year. Find the amount of annual instalment.

[Given: $(1.06)^{-20} = 0.312$]

OR

3(b). The revenues of a company over a period are given as follows:

Year	2015	2016	2017	2018
Revenue (in thousands ₹)	100	115	150	200

Calculate CAGR over the 3-year period spanning the end of 2015 to the end of 2018.

[Given: $(2)^{1/3} = 1.26$]

4. A bulb producing factory claims that its bulb has a mean life of 20 months. A random sample of 8 such bulbs gave the following values:

Life of bulbs (in months): 24, 22, 27, 18, 20, 24, 22, 19.

Test the factory claim at 5% level of significance.

[Given: $t_{(7, 0.05)} = 2.36$]

5. For the following data, calculate trend values, using 3-yearly moving averages:

Year	Production
2011	412
2012	438
2013	446
2014	454
2015	470
2016	483
2017	490

6. The feasible region of the LPP

Minimise $z = 5x + 7y$

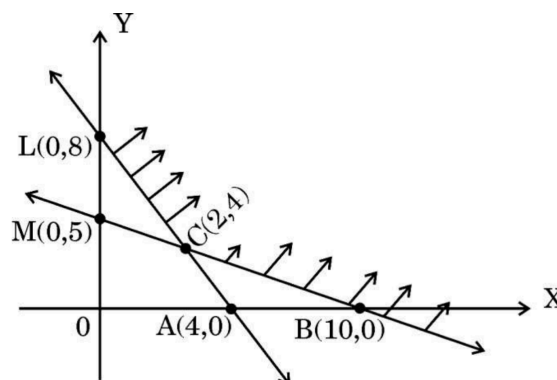
subject to constraints

$$2x + y \geq 8$$

$$x + 2y \geq 10$$

$$x \geq 0, y \geq 0$$

is given below. Determine the optimal solution and justify your answer.



Section B

7. Fit a straight line trend by the method of least squares to the following data:

Year	Sales (in lakh ₹)
2010	65
2012	68
2013	70
2014	72
2015	75
2016	67
2019	73

8. What nominal rate compounded monthly will be equivalent to 6% compounded semi-annually?

[Given: $\log(1.0609) = 0.02567$; $\text{antilog}(0.002139) = 1.00493$]

9. A group of 5 patients treated with medicine A weigh 10, 8, 12, 6, 4 kg. A second group of 7 patients treated with medicine B weigh 14, 12, 8, 10, 6, 2, 11 kg. Comment on the rejection of hypothesis with 5% level of significance.

[Given: $t_{(10, 0.05)} = 1.812$]

10(a). The demand and supply functions for a commodity are $p_d = 56 - x^2$ and $p_s = 8 + \frac{x^2}{3}$. Find the consumer's surplus at equilibrium price.

OR

10(b). Evaluate:

$$\int_0^1 \log(1 + 2x) dx$$

Section C

11. It is known that, if the interest is compounded continuously, the principal changes at the rate equal to the product of the rate of bank interest per annum and the principal.

(a) If the interest is compounded continuously at 5% p.a., in how many years will ₹ 100 double?

(b) At what interest rate will ₹ 100 double itself in 10 years?

[Given: $\log_e 2 = 0.6931$]

12(a). Mrs. Jain is considering to buy a ₹ 1,000 par value bond bearing a coupon rate of 11% that matures after 5 years. She wants a minimum rate of return of 15%. The bond is currently sold at ₹ 870. Should she buy the bond? Justify your answer.

[Given: $(1.15)^{-5} = 0.4971$]

OR

12(b). A music band company has gained much popularity all over the country. They buy a bus to travel to their destinations. The purchase price of the bus is ₹ 88,50,000. The bus will be depreciated linearly over 10 years and will have a scrap value of ₹ 25,50,000.

(i) Determine the rate of depreciation.

(ii) Determine the book value of the bus at the end of 5 years.

(iii) When will the bus be worth ₹ 44,40,000?

13. Anil plans to send his daughter for higher studies abroad after 10 years. He expects the cost of the studies to be ₹ 2,00,000. How much must he set aside at the end of each quarter for 10 years to accumulate this amount, if money is worth 6% compounded quarterly?

[Given: $(1.015)^{40} = 1.8140$]

14. A diet for a sick person must contain at least 4,000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods X and Y are available at a cost of ₹ 4 and ₹ 3 per unit respectively. One unit of food X contains 200 units of vitamins, 1 unit of minerals and 40 units of calories, whereas one unit of food Y contains 100 units of vitamins, 2 units of minerals and 40 units of calories.

Based on the above information, answer the following questions:

(a) To minimise the cost of diet, formulate the above problem as an LPP.

(b) Determine the number of units of each food required to satisfy the requirements.

- End of Question Paper -