



Delhi Public School, Howrah

PERIODIC TEST- III
Session: 2024 - 2025
Class - XII

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

Subject: - Applied Mathematics (Code No-241)

Time: 3 Hours

F.M. : 80

General Instructions:

1. This question paper contains five sections A, B, C, D and E. Each section is compulsory.
2. Section - A carries 20 marks weightage, Section - B carries 10 marks weightage, Section - C carries 18 marks weightage, Section - D carries 20 marks weightage and Section - E has 3 case-based questions with total weightage of 12 marks.

Section – A:

3. It comprises of 20 MCQs of 1 mark each.

Section – B:

4. It comprises of 5 VSA type questions of 2 marks each.

Section – C:

5. It comprises of 6 SA type of questions of 3 marks each.

Section – D:

6. It comprises of 4 LA type of questions of 5 marks each.

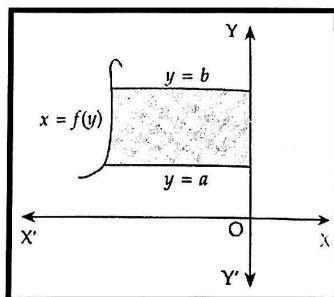
Section – E:

7. It has 3 case studies. Each case study comprises of 3 case-based questions, where 2 VSA type questions are of 1 mark each and 1 SA type question is of 2 marks. Internal choice is provided in 2 marks question in each case-study.
8. Internal choice is provided in 2 questions in Section - B, 2 questions in Section – C, 2 questions in Section - D. You have to attempt only one of the alternatives in all such questions.

SECTION A

- 1) In the adjoining figure, the area bounded by the curve $x = f(y)$, y -axis and the abscissa $y = a$ and $y = b$ is equal to

1



a) $\int_a^b f(y) dy$

b) $\int_a^b f(x) dx$

c) $\int_a^b |f(y)| dy$

d) $\int_a^b |f(x)| dx$

- 2) A statement made about a population parameter for testing purpose is called

1

a) statistic

b) parameter

c) hypothesis

d) level of significance

- 3) If the selling price of a commodity is fixed at ₹ 45 and the cost function is $C(x) = 30x + 240$, then the break-even point is

1

a) 10

b) 12

c) 15

d) 16

(28) A traffic engineer records the number of bicycle riders that use a particular circular track. He records that an average of 3.2 bicycle riders uses the cycle track every hour. Given that the number of bicycles that use the cycle track follows a Poisson distribution, what is the probability that

(i) 2 or less bicycle riders will use the cycle track within an hour?

(ii) 3 or more bicycle riders will use the cycle track within an hour?

(29) Diwakar invested ₹ 300000 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: $(1.5)^{\frac{1}{5}} = 1.084$].

(30) David wants to invest at most ₹12000 in Bonds A and B. According to the rule, he has to invest at least ₹ 2000 in Bond A and at least ₹ 4000 in Bond B. If the rates of interest on Bonds A and B respectively are 8 % and 10 % per annum, formulate the problem as L.P.P and solve it graphically for maximum interest. Also, determine the maximum interest received in a year.

(31) (a) The probability that Rohit will hit a shooting target is $\frac{2}{3}$. While preparing for an international shooting competition, Rohit aims to achieve the probability of hitting the target at least once to be 0.99. What is the minimum number of chances must he shoot to attain this probability?

OR

(b) A coin is tossed 400 times and it shows head 220 times. Discuss whether the coin is unbiased or not.

SECTION D

(All questions are compulsory. In case of internal choice, attempt any one question only)

(32) (a) Fit a straight-line trend by using the method of least squares for the following data and calculate the trend value for the year 2008.

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

OR

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

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

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

(33) (a) Three friends—Aman, Bina, and Charu—decide to divide the profit of their startup based on their initial investments, which follow a quadratic relationship. Let the profit of each friend (P_A, P_B, P_C) depend on the amount they invested (x) according to the equation:

$$P = ax^2 + bx + c$$

Where $a \neq 0$ and $a, b, c \in R$. The profits are distributed as follows:

1. Aman invested ₹ 10,000 and earned ₹ 15,000.
2. Bina invested ₹ 20,000 and earned ₹ 40,000.
3. Charu invested ₹ 30,000 and earned ₹ 75,000.

Based on the above information, use Cramer's Rule, determine the values of a, b, c .

OR

(b) A water fountain shoots a stream of water vertically upward, and the height $h(t)$ of the water stream above the ground after t seconds is modeled by:

$$h(t) = at^2 + bt + c$$

where $a, b, c \in R, a \neq 0$. The following observations were made:

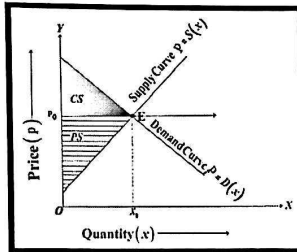
1. After 5 seconds, the water reaches a height of 50 m.
2. After 10 seconds, the water reaches a height of 120 m.
3. After 15 seconds, the water reaches a height of 170 m.

Based on the above information, answer the following questions.

(a) Write a system of three linear equations in terms of a , b , and c .

(b) Solve for a , b , and c using the matrix method.

(34) The following graph illustrates the demand and supply curves for a smart phone manufacturer. The demand and supply functions are both linear.



a. The manufacturer sold 50 units per month when the price of the smart phone was ₹ 50,000 per unit. They sold 150 units per month when the price dropped to ₹ 30,000 per unit.

b. At a price of ₹ 60,000 per unit, 200 units were available in the market every month. At a price of ₹30,000 per unit, 100 units remained available.

Based on the above information, answer the following questions.

(i) Find the demand function.

3

(ii) Determine the consumer surplus if the supply function is given as: $S(x) = 200x + 10000$.

2

(35) A laptop costing ₹50,000 is expected to depreciate linearly to a salvage value of ₹10,000 over 5 years. A new laptop at that time (i.e., after 5 years) is expected to cost ₹65,000. To provide funds for the difference between the replacement cost and the salvage value, a sinking fund is established, with equal payments made at the end of each year. The fund earns interest at the rate of 6% compounded annually. Based on the above information, answer the following questions.

(i) How much should each payment into the sinking fund be?

3

(ii) Calculate the annual depreciation of the laptop's value over 5 years and the rate of depreciation using the straight-line method. Use: $(1.06)^5 = 1.3382$.

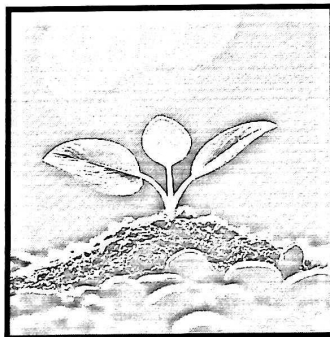
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SECTION E

(All questions are compulsory. In case of internal choice, attempt any one question only)

36. CASE STUDY – I

The relation between the height of the plant (y in cm) with respect to exposure to sunlight is governed by the following equation $y = 4x - \frac{1}{2}x^2$, where x is the number of days exposed to sunlight.



Based on the above information, answer the following questions.

(i) Find the rate of growth of the plant with respect to number of days exposed to sunlight.

1

(ii) What will be the height of the plant after two days?

1

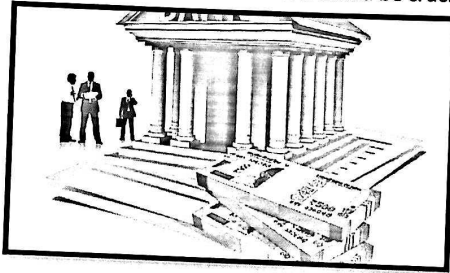
(iii) What is the number of days it would take for the plant to grow to the maximum height? 2

OR

(iv) If the height of the plant is $\frac{7}{2}$ cm, find the number of days it has been exposed to the sunlight. 2

37. CASE STUDY – II

In the year 2000, Mr. Talwar, a middle-aged businessman with dreams of building a luxurious home for his family, approached the State Bank of India for a home loan. With aspirations soaring high, he finalized a loan of ₹30,000,000 to be repaid over the next 20 years. The bank offered him an interest rate of 7.5% per annum, compounded monthly. With this loan, Mr. Talwar embarked on his journey to turn his dream home into reality, knowing that his financial planning and hard work would be crucial to fulfilling this commitment.



Based on the above information, answer the following questions. Use $(1.00625)^{240} = 4.4608$, $(1.00625)^{91} = 1.7629$, $(1.00625)^{48} = 1.1187$.

(a) Find the EMI paid by Mr. Talwar. 2

OR

(b) Find the interest paid by Mr. Talwar in 150th Payment. 2

(b) Find the principal paid by Mr. Talwar in 150th payment. 1

(c) Find the total interest paid by Mr. Talwar in 150th payment. 1

(38) CASE STUDY – III

An oil company has two depots A and B with capacities of 7000 litres and 4000 litres respectively. The company is to supply oil to three petrol pumps D, E and F whose requirements are 4500 litres, 3000 litres and 3500 litres respectively. The distance (in km) between the depots and petrol pumps is given in the following table:

		Distance from the depot (in km)	
To	From	A	B
	D	7	3
	E	6	4
	F	3	2

Assuming that the transportation cost per km is ₹ 1 per litre. How should the delivery be scheduled in order that the transportation cost is minimum? What is the minimum cost? 4
