

BUDHA DAL PUBLIC SCHOOL PATIALA
PRE BOARD EXAMINATION (16 December 2025)

Class - XII

Paper- Applied Mathematics (241)

M.M. 80

Time: 3hrs.

General Instructions:

1. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer type questions of 2 marks each.
4. Section C has 6 Short Answer type questions of 3 marks each.
5. Section D has 4 Long Answer type questions of 5 marks each.
6. Section E has 3 case based studies of 4 marks each.

Section - A

1. The smallest non-negative integer congruent to $2796 \pmod{6}$ is
a) 1 b) 2 c) 5 d) 3
2. If $A = \begin{bmatrix} 2 & x+7 \\ 2x-3 & x+8 \end{bmatrix}$ is symmetric, then x is equal to
a) 1 b) 10 c) 5 d) 4
3. If the cost function of a firm is given by $C(x) = 2x^2 - 4x + 5$, then average cost, when $x = 2$ is
a) 2.5 b) 2 c) 1.5 d) 1
4. The rise in price before Diwali is an example of
a) seasonal trend b) cyclic trend c) long term trend d) irregular trend
5. Let X is a normal distribution random variable with mean $\mu = 55$ and standard deviation $\sigma = 12$. The value of probability $P(X < 70)$ is [given $F(1.25) = 0.8944$]
a) 0.9332 b) 0.9216 c) 0.8944 d) 0.1056
6. If $\lambda = 1$ in Poisson distribution, then the value of $P(5)$ is (given $e^{-1} = 0.368$)
a) 0.307 b) 0.00307 c) 0.0307 d) 0.000307
7. The speed of motorboat in still water is 45 km/h. If the motorboat travels 80 km along stream in 1 h 20 min, then time taken by it to cover the same distance against the stream is
a) 1 h 20 min b) 3 h 40 mins c) 2 h 40 min d) 2 h 55 min
8. A solution containing 15% spirit should be mixed with a solution containing 25% spirit so that the resultant mixture contains 21% spirit in the ratio.
a) 1 : 3 b) 2 : 3 c) 3 : 4 d) 4 : 5
9. A person buys a house for which he agrees to pay Rs. 5000 at the end of each month. If money is worth 12% converted monthly. Then the cash price of the house is
(given $(1.01)^{-6} = 0.3847$)
a) Rs. 307650 b) Rs. 407650 c) Rs. 507650 d) None of these

10. The interval in which $f(x) = x^4 - 2x^2$ is increasing in
 a) $(-1, 0)$ b) $(1, \infty)$ c) $(0, 1)$ d) $(-1, 0) \cup (1, \infty)$
11. Mr. Ahuja borrowed Rs. 100000 from a bank to purchase a car and decided to repay the loan by equal monthly installments in 10 years. If bank charges interest at 9% per annum compounded monthly, then the value of EMI is (given $(1.0075)^{120} = 2.4514$)
 a) Rs. 1250 b) Rs. 1266.74 c) Rs. 1300 d) None of the above
12. The area of the region bounded by the curve $x^2 = 4y$, the line $x = 2$ and $X - axis$ is
 a) 1 sq unit b) $\frac{2}{3}$ sq units c) $\frac{4}{3}$ sq units d) $\frac{8}{3}$ sq units
13. Evaluate $\int_2^3 3^x dx$
 a) $\frac{9}{\log 3}$ b) $18 \log \frac{1}{3}$ c) $18 \log 3$ d) $\frac{18}{\log 3}$
14. A statement made about a population for testing purpose is called
 a) testing statistics b) level of significance c) statistics d) hypothesis
15. If the null hypothesis is false, then which of the following is accepted?
 a) Alternate hypothesis b) Null hypothesis c) Negative hypothesis d) Positive hypothesis
16. If $\begin{bmatrix} x+y \\ x-y \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ -2 \end{bmatrix}$, then (x, y) is
 a) $(1, 1)$ b) $(1, -1)$ c) $(-1, 1)$ d) $(-1, -1)$
17. In a 100 m race, A taken 36 s and B takes 45 s, then A defeat B with the distance of
 a) 20m b) 25 m c) 50 m d) 15 m
18. At what rate of interest will the present value of a perpetuity of Rs. 300 payable at the end each quarter Rs. 24000.
 a) 4% b) 5% c) 6% d) 8%

Assertion - Reason Based Questions

The following questions consists of two statements - Assertion (A) and Reason Answer the question selecting appropriate option given below:

- a) Both A and R are true and R is correct explanation for R.
 b) Both A and R are true but R is not correct explanation for R.
 c) A is true but R is false.
 d) A is false but R is true.
19. Assertion (A) : The present value perfect ^{of} Rs. 900 payable at the end of each year of r worth 5% annum is Rs. 20000.
 Reason (R) : The present value of Rs. R payable at the end of each payment period whe period is R/i .
20. Assertion (A) : If $|x - 5| < 2$ $x \in R$, then $x \in [3, 7]$
 Reason (R) : $|x| < a, \text{ iff } -a < x < a$

Section - B

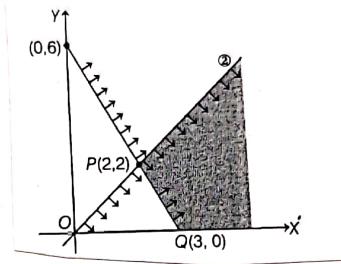
21. A mixture contains milk and water in the ratio 2 : 3. A certain quantity of milk is added to the mixture such that the ratio of milk and water becomes 2 : 1. Find the percentage of milk added in the original mixture with respect to original quantity of solution.

OR

Three pipes A, B and C can fill a tank in 30 min, 20 min and 10 min, respectively. When the tank is empty, all the three pipes are opened. If A, B and C discharge chemical solutions P, Q and R respectively then find the part of solution R in the liquid in the tank after 3 min.

22. The feasible region of the LPP, Minimize $Z = 3x + 2y$

Subject to constraints are $2x + y \geq 6, x - y \geq 0, x \geq 0, y \geq 0$ is given below



Determine the optimal solution. Justify your answer.

23. The marginal revenue function for a commodity is given by $MR = 9 + 2x - 6x^2$. Find the demand function.

OR

The marginal cost of producing x pairs of tennis shoes is given by $MC = 50 + \frac{300}{x+1}$ if the fixed cost is Rs. 2000, find the total cost function.

24. A person invested Rs. 15000 in a mutual fund and the value of investment at the time redemption was Rs. 25000. If CAGR for this investment is 8.88%, calculate the time period for which the amount was invested?

(given $\log(1.667) = 0.2219$ and $\log(1.089) = 0.037$)

25. Find the present value of perpetuity of Rs. 600 at end of each quarter, if money is worth compounded quarterly.

Section - C

26. The following table shows the quarterly sales (Rs. in crore) of a real estate company. Compute the trend by quarterly moving averages.

Years/Quarters	Q ₁	Q ₂	Q ₃	Q ₄
2018	12	14	18	20
2019	18	16	20	22
2020	27	24	30	36

27. A machine produces washers of thickness 0.50 mm. To determine whether the machine is in proper working order, a sample of 10 washers is chosen for which the mean thickness is 0.53 mm and the standard deviation is 0.03 mm. Test the hypothesis at 5% level of significance that the machine is working in proper order. (given $t_{0.025} = 2.262$ at $v = 9$)
28. If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$, find $\text{adj } A$
29. Find the interval in which $f(x) = x + \frac{1}{x}$ is (i) increasing (ii) decreasing
30. A machine costing Rs. 50000 is to be replaced at the end of 10 year, when it will have a salvage value of Rs. 5000. In order to provide money at that time for a machine costing the same amount, a sinking fund is set up. If equal payments are placed in the fund at the end of each quarter and the fund earns 8% compounded quarterly, then what should each payment be?
(given $(1.02)^{40} = 2.208$)
31. Evaluate $\int \frac{1}{x-x^3} dx$

Section - D

32. Amit has taken a loan of Rs. 1000000 with interest rate 11% per annum for the period of 15 yr. Calculate (reducing) EMI for the above data. (given $(1.0091)^{180} = 5.1068$)
33. If the marginal revenue functions of a commodity is $MR = 9 - 6x^2 + 2x$, find the total revenue and the corresponding demand functions.

OR

The marginal cost of a product is a constant multiple of number of units (x) produced. Find the total cost and the average cost function, if the fixed costs is Rs. 2000 and cost of producing 20 units is Rs. 3000.

34. Fit a straight line trend by the method of least squares to the following data on sales (Rs. in lakh) for the period 2005 - 2012.

Year	2005	2006	2007	2008	2009	2010	2011	2012
Sales (Rs.in lakh)	76	80	130	144	138	120	174	190

Also calculate the trend values from 2005 to 2012.

35. Find the minimum value of Z for the problem, minimise $Z = x + 2y$, subject to constraints $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$.

36. The cost of AC depreciates by ₹ 722 during the third year and by ₹ 685.90 during the fourth year.



DEPRECIATION

Based on above information, answer the following questions.

- Find the rate of depreciation per annum. [1]
- Find the original cost of AC. [1]
- Find the total depreciation in its value at the end of 4 yr. [2]

Or

Find the scrap value of AC of the estimated useful life is 15 yr.

(given, $(0.95)^{15} = 0.4633$) [2]

37. Varun and Isha decided to play with dice to keep themselves busy at home as their schools are closed due to covid pandemic. Varun throw a dice, until a six is obtained. He denote the number of throws required by X.



Based on above information answer the following question.

- Find the probability that $X = 2$. [1]
- Find the probability that $X = 4$. [1]
- Find the probability that $X > 3$. [2]

Or

Find the value of $P(X \geq 6)$. [2]

- 38 A man can row against the current, three fourth of a kilometer in 15 min and returns same distance in 10 min.



Based on the above information answer the following questions.

- Find the speed of the current. [1]
- Find the speed of men in still water. [1]
- If a man can row a distance of 3 km against the stream, then find the time he would cover the distance. [2]

Or

If the time taken by a man to cover 4.5 km downstream and x km upstream is same, then find the value of x. [2]