

APPLIED MATHEMATICS (241)
CLASS 12
SAMPLE PAPER

Time Allowed: 3 hours

Maximum Marks: 80

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 20 MCQ's and 01 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts and internal choices.

SECTION-A

1. The value of $(-6 \times 5) \pmod{7}$ is
(a) 2 (b) -5 (c) 1 (d) 5
2. If $y > x$ then which of expression will have the highest value, given that x and y are a positive integers:
(a) $x + y$ (b) $x - y$ (c) xy (d) can't say
3. In a 500m race, A reaches the finishing point in 20 seconds and B reaches in 25 seconds, A beats B by
(a) 25m (b) 100m (c) 50m (d) 125m
4. The speed of the boat is 15km/hrs in still water and the speed of the stream is 3km/hr. The boat travelled in 12 minutes is.....
(a) 1.2km (b) 1.8km (c) 2.4 km (d) 3.6 km
5. In what ratio must a grocer mix two varieties of pulses costing Rs. 85 per kg and Rs.100 per kg so to get a mixture of Rs.92 per kg ?
(a) 7:8 (b) 8:7 (c) 5:7 (d) 7:5
6. If $x = at^2$ and $y = 2at$ then $\frac{d^2y}{dx^2} = \text{-----}$

(a) $-\frac{1}{2at^2}$ (b) $-\frac{1}{2at^3}$ (c) $\frac{1}{t^2}$ (d) $-\frac{2a}{t}$

7. Two dice are thrown n times in succession. The probability of obtaining a double six at least once is

(a) $\left(\frac{1}{36}\right)^n$ (b) $1-\left(\frac{35}{36}\right)^n$ (c) $\left(\frac{1}{12}\right)^n$ (d) none of these

8. A fire in a factory delaying production for some time is

(a) Long term trend (b) Cyclical trend (c) Seasonal trend (d) Irregular trend

9. For the given five values 15,18,33,24, 42 , then the 3 years moving average are,

(a) 19,22,33 (b) 19,25, 31 (c) 19,30,31 (d) 19,25,33

10. The present value of a perpetuity of Rs. 750 payable at the beginning of each year , if the money is worth 5% per year is

(a) Rs. 15000 (b) Rs.15750 (c) Rs. 14250 (d) None of these.

11. The effective rate of return, which is equivalent to a declared rate of 12% compounded semiannually, is

(a) 11.86% (b) 11.96% (c) 12.36 (d) 12.54%

12. A printing machine costing Rs X would reduce to Rs. 10000 in 7 years. If the annual depreciation charge is Rs.10000, the the value of X is

(a) 80000 (b) 70000 (c) 60000 (d) None of these.

13. Manas invested Rs.20000 in a mutual fund in the year 2015. The value of the mutual fund increased to Rs. 32000 in the year 2020. Then Compounded Annual Growth Rate of his investment is (Use $1.25^{1/5}$ is =1.057)

(a) 5.7% (b) 10.57% (c) 57% (d) none of these

14. What amount should he deposited at the end of every 6 months to accumulate Rs. 50000 in 8 years, if the money is worth 6% p.a. compounded semi annually? (Given $(1.03)^{16} = 1.6047$)

- (a) Rs. 3432.53 (b) Rs.2783.08 (c) Rs. 2480.57 (d) Rs. 2149.93

15. In an L.P.P. if the objective function $Z = ax + by$ has same maximum value on two corner points of the feasible region, then the number of points at which maximum value occurs is

- (a) 0 (b) 2 (c) infinite (d) finite

16. In a village, a random sample of 350 persons is taken to check whether a person's average income is Rs. 2000 or not. The collected data of average income of sample person is presented in in a frequency distribution,

which is called a:

- (a) statistics (b) sampling distribution (c) parameter
(d) population sampling

A rice miller visited the rice market. He took a handful of rice from the random sack of rice, in order to check the quality of rice. The handful of rice taken from a sack of rice for quality inspection is a:

- (a) statistics (b) population (c) parameter (d) sample

18. From the purpose of t-test of significantly, a random sample of size (n) 49 is drawn from a normal population, then the degree of freedom is:

- (a) 1/48 (b) 47 (c) 48 (d) 50

For questions 19 and 20, two statements are given – one labeled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below:

- (i) Both A and B are true and R is correct explanation to the assertion.
- (ii) Both A and R are true but R is not correct explanation to the assertion.
- (iii) A is true but R is false.
- (iv) A is false but R is true.

19. Assertion (A): A die is thrown 100 times. If getting an even number is considered a success, then the variance of the number of success is 25.

Reason (R): The variance of the binomial distribution is $\sigma^2 = npq$, Where n = number of trials, p = probability of success and q = probability of failure.

- (a) i (b) ii (c) iii (d) iv

20. Assertion (A): A person invested Rs. 50000 in an investment plan and after two years it has grown to Rs. 60000. His rate of return is 20%.

Reason (R) : Return on investment (ROI) = $\frac{\text{Net profit/loss}}{\text{Current Value of Investment}}$

- (a) i (b) ii (c) iii (d) iv

SECTION B

21. Abhijit has two investment options 8.4% compounded monthly or 8.5 % compounded quarterly. Which is the better investment?

22. If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find the value of $A^2 - 3I - 2A$.

OR

If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, find the value of α for which $A^2 = B$.

23. What money should be deposited at the end of every 6 months to accumulate Rs. 50000 in 8 years, the money is worth 6% p.a. compounded semiannually? (Given $(1.03)^{16}=1.6047$)

24. Two vessels A and B contains milk and water in the ratio 3:2 and 7:13 respectively. They are mixed in the ratio 2:3. Find the new ratio of the mixture.

OR

It is 7 P.M. currently. What is the time (in A. M. or P. M.) Will be in next 1000 hours?

25. The corner points of the feasible region for an LPP are (0,3), (1,1) and (3,0) . If objective function $Z = px + qy$, $p, q > 0$, find the relation on p and q, so that minimum value of Z occurs at (1,1) and (3,0).

SECTION C

26. Find the intervals in which the function $f(x) = 20-9x +6x^2 -x^3$ is strictly increasing or decreasing.

OR

Find the equation of tangent and normal to the curve $f(x) = x^3 -2x^2+3x +2$ at the point (0, 2).

27. Integrate: $\int e^x \left(\frac{1}{x^2} - \frac{2}{x} \right) dx$

OR

Solve: $y \log y dx - x dy = 0$

28. The demand supply functions are $p_d = 50 - 8x$ and $p_s = 5 + x$ respectively.

Determine the consumer surplus and producer surplus at equilibrium price.

29. Find the matrix X for which $\begin{bmatrix} 5 & 4 \\ 1 & 1 \end{bmatrix} X = \begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}$

30. Biswa purchased a laptop worth Rs. 80000 with a down payment Rs.20000 and balance in equal in monthly installment in 2 years. If bank charges 9% p.a. compounded monthly installment.

Calculate EMI. (Given $(1.0075)^{24} = 1.1964$)

31. Itishree purchased an AC for Rs. 3,00,000 and incurred Rs. 21,000 towards freight, Rs 3000 towards carriage and Rs 8000 towards installation charges. It has been estimated that the

machinery will have a scrap value Rs. 30,000 at the end of the useful life which is four years. What will be the annual depreciation and the value of the machinery after 4 years according to linear method?

SECTION D

32. A particular river near a small-town floods and overflows twice in every 10-years on an average. Assuming that the Poisson distribution is appropriate, what is the mean expectation.

Also calculate the probability of 3 or less overflow floods in a 10-year interval.

OR

If the sum and product of the mean and variance of Binomial Distribution are 1.8 and 0.8 respectively. Find the probability distribution and the probably at least one success.

33. A firm has the cost function $C(x) = \frac{x^3}{3} - 7x^2 + 11x + 50$ and the demand function $x = 100 - p$. Find the total revenue and profit function in term of x . What is the maximum profit?

OR.

Find the area of the region bounded by the curve $4y = 3x^2$ and the line $2y = 3x + 12$.

34. A company produced two types of goods, A and B, that requires gold and silver. Each unit of type A requires 3 gms of silver and 1 gm of gold, while that of type B requires 1 gm of silver

and 2 gms of gold. The company can produce 9 gms of silver and 10 gms of gold. If each unit of type A gives a profit of Rs. 40 and that of type B Rs. 50. Find the maximum profit by graphically.

35. Solve by using Cramer's Rule: $x - y + z = 4$, $2x + y - 3z = 0$, $x + y + z = 2$

SECTION E

36. Jitesh is rowing a boat. He takes 6 hours to row 48 kms upstream and 3 hours to go same distance in downstream. Base on the above information, answer the following questions:

(i) What is his speed of boat rowing in still water?

(ii) What is the speed of stream?

(iii) What is his average speed? OR How much time will he take to travel 64 kms and return back from the starting point ?

37. There are 500 persons of age 55 years in a town. The chance that person aged 55 years will die within next 5 years is 1%. Based on the above information, answer the following questions: (Given $e^{-5}=0.0067$)

(i) Find the probability that exactly 4 persons will die within next 5 years.

(ii) Find the probability that none of the person aged 55 will die within next 5 years.

(iii) Find the probability that at most 3 persons aged 55 will die within next 5 years. OR Find the probability that more than 3 persons aged 55 will die within next 5 years.

38. Based on the data available for the sales of an item in a district, by the method of least squares.

Year	1996	1997	1998	1999	2000	2001
Sales in lakh Rupees	6.5	5.3	4.3	6.1	5.6	7.8

(i) Tabulate the trend values.

(ii) Find the best fit for a straight-line trend.

(iii) Compute expected sale trend for year 2002 Year OR Compute expected sale trend for year 1994 Year.