Sample Paper

Class XII

Applied Mathematics

Section-A

1. What is the least value of 'x' that satisfies $x \equiv 27 \pmod 4$, when $27 < x \le 36$?

(a) 27   (b) 30   (c) 31   (d) 35.

2. If $A = \begin{bmatrix} 3 & -3 \\ -3 & 3 \end{bmatrix}$ and $A^2 = \lambda A$, then the value of λ is

(a) 3   (b) 6   (c) 9   (d) 12.

3. If the varience of a Poisson distribution is 2, then $P(x=2)$ is

(a) $2/e^2$ (b) $2e^2$ (c) $4/e^2$ (d) $4e^2$.

4. If $x = t + \frac{1}{t}$, $y = t - \frac{1}{t}$, then $\frac{dy}{dx} =$.

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

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

(a) 11.86%   (b) 11.98%   (c) 12.36%   (d) 12.54%.

6. For the given five values 15, 24, 18, 33, 42 the three years moving averages are

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

7. A machine costing ₹ 50,000 has a useful life of 4 years. The estimated scrap value of ₹10,000. Using straight line method, the annual depriciation is

(a) ₹ 8000 (b) ₹ 10000 (c) ₹ 10500
(d) ₹ 12000.

8. General solution of the differential equation: $y \log y \, dx - x \, dy = 0$ is

(a) $y = \log |Cx|$ (b) $y = e^{|cx|}$ (c) $y = e^{cx}$
(d) $\log y = |c + x|$

9. A fair coin is tossed twice and outcomes are noted. If the random variable 'X' represents the number of heads that appeared in the experiment, then the mathematical expectation of X is

(a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $1\frac{1}{2}$.

10. The value of $\Delta = \begin{vmatrix} 42 & 2 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$ is

(a) 0 (b) 1 (c) -3 (d) -15

11. Inferential statistics is the process that involves all of the following except

(a) estimating a parameter
(b) estimating a statistic
(c) test a hypothesis
(d) analyse relationships

12. If $y = e^{-2x}$, then $\frac{d^3 y}{dx^3}$ is equal to

(a) $2e^{-2x}$ (b) e^{-4x} (c) $4e^{-4x}$ (d) $-8e^{-2x}$

13. Rohan invested ₹300000 in a fund for two yrs. At the end of 2 yrs. the investment was worth ₹327000. Rohan's rate of return is

(a) 6% (b) 7% (c) 8% (d) 9%

14. A chocolate bar sells for ₹20. The average revenue by selling 30 bars is
    (a) ₹20 (b) ₹600 (c) ₹40 (d) ₹30.

15. The present value of a perpetuity of ₹750 payable at the beginning of each year, if money is worth 5% p.a, is
    (a) ₹15000 (b) ₹15750 (c) ₹14250 (d) none of these.

16. An investment of ₹10,000 becomes ₹60,000 in 4 years, then the CAGR is given by.
    (a) $\dfrac{\sqrt[4]{6}-1}{100}$ (b) $\dfrac{\sqrt[4]{6}+1}{100}$ (c) $(\sqrt[4]{6}-1)\times100$
    (d) $(\sqrt[4]{6}+1)\times100$.

17. A specific characteristic of a population is known as a.
    (a) sample (b) parameter (c) statistic
    (d) mean.

18. What time will it be after 1275 hours, if the present time is 9:00 pm?
    (a) 11 pm (b) 12 midnight (c) 9 pm (d) 9 am.

19. A: If 'x' is a negative integer, then the solution set of $-12x>30$ is $\{----5,-4,-3\}$.
    R: If $\frac{1}{2}\left(\frac{3}{5}x+4\right)\geqslant\frac{1}{3}(x-6)$, $x\in R$ then
    $x\in(-\infty,120]$.

20. A: If the feasible region for an LPP is bounded, then the objective function $z=ax+by$ has both maximum and minimum values.
    R: A feasible region of a system of linear inequalities is said to be bounded if it can be enclosed within a circle.

Section-B (2 marks)

21. Find the matrix X for which

$$\begin{bmatrix} 5 & 4 \\ 1 & 1 \end{bmatrix} X = \begin{bmatrix} 1 & -2 \\ 1 & 3 \end{bmatrix}$$

22. Maximise $Z = 3x + 4y$ s.t.c $x - y \leq -1$, $-x + y \leq 0$, $x, y \geq 0$.

23. Mr. X took a loan of ₹2000 for 6 months. Lender deducts ₹200 as interest while lending. Find the effective rate of interest charged by lender.

24. If A, B and C are 3 matrices such that $A + B = A + C$, then prove that $B = C$.

25. An asset, the life of which is estimated to be 8 years costs ₹80000. If annual depreciation is ₹9000, find its scrap value using linear method.

Section - C (3 marks)

26. The demand and supply functions under the pure market competition are $P_d = 16 - x^2$ and $P_s = 2x^2 + 4$ respectively, where p is the price and x is the quantity of the commodity. Using integrals, find Consumer's surplus.

27. A 99% confidence interval for a population mean was reported to be 83 to 87. If $\sigma = 8$, what sample size was used in this study? $(Z_{0.005} = 2.576)$.

28. Evaluate $\displaystyle\int_{1/3}^{1} \frac{(x - x^3)^{1/3}}{x^4} dx$

OR

$\displaystyle\int \frac{1}{x(x^n + 1)} dx$.

29. How many times must a man toss a fair coin, so that the probability of having atleast one head is more than 80%

OR.

If the mean and varience of a Binomial variale X are 8 and 4 respectively, then find the value of $P(X < 3)$.

30. A man can row at 16 km/hr in still water and finds that it takes him thrice as much time to row up than as to row down the same distance in the river. Find the speed of the current.

31. Consider a hypothetical population comprising of only 4 values 4, 6, 8 and 10. Find the point estimation of population varience (σ^2). Also, find standard error of sample varience (S^2).

32. S-D

There are 15 bulbs in a box, which included 5 defective bulbs. From the box a sample of 4 bulbs as is drawn one by one with replacement. Determine the probability distribution of the number of defective bulbs, also find the mean of distribution

33. The average no. (in lakhs) of working days lost in strikes during each year of the period 1981-'90 was

Yr.	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Avg.	1.5	1.8	1.9	2.2	2.6	3.7	2.2	6.4	3.6	5.4

Calculate the 3-year moving averages and determine the trend value for the year 1982. Draw the moving average graph.

34. Two containers of equal capacity are full of mixtures of oil and water. In the first ratio of oil to water is $4:7$ and in the second, it is $7:11$. Now, both the mixtures are mixed in a bigger container. Find the resulting ratio of oil to water.

35. Find the positive numbers x and y such that $x+y=60$ and xy^3 is maximum.