

O. P. JINDAL SCHOOL, SAVITRI NAGAR**Annual Examination (2025 – 2026)****Class: XI****Subject: Applied Mathematics****MM: 80****Time: 3 Hrs.****Fifteen Minutes Extra will be for reading the Question Paper.****General Instructions:**

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 18 MCQ's and 02 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.

SECTION A**This section comprises of Multiple Choice Questions (MCQ) of 1 mark each**

1. Which of the following binary numbers is equivalent to decimal number 54?
(a) 110110 (b) 110010 (c) 101110 (d) 101110
2. A retailer purchased a fan for Rs 1500 from a wholesaler and sells it to a consumer at 10% profit. If the sales are intra-state and the rate of GST is 12%, the tax (under GST) received by the Central Government is :
(a) 90 (b) 198 (c) 180 (d) 99
3. A, B, C, D are playing a game of Ludo. A, C and B, D are partners (partners sit opposite to each other). C is to the left of D who is facing south. In which direction is A's face:
(a) North (b) West (c) South (d) East
4. If $\log_{\sqrt{3}} 27 = x$, then the value of x is :
(a) 3 (b) 4 (c) 6 (d) 9
5. If $x = at^2$ and $y = 2at$, then at $t = 2$ the value of $\frac{dy}{dx}$ is:
(a) 2 (b) 1.5 (c) 1.5a (d) 0.5
6. The slope of the line $2x - 5y + 7 = 0$ is
(a) $-\frac{5}{2}$ (b) $\frac{2}{5}$ (c) 2 (d) $\frac{5}{2}$
7. The equation of parabola with vertex at origin and directrix $y = -3$ is
(a) $y^2 = -12x$ (b) $x^2 = -12y$ (c) $x^2 = 12y$ (d) $y^2 = -12x$
8. The centre of the circle $x^2 + y^2 + 4x - 6y - 38 = 0$ is
(a) $(1, -3/2)$ (b) $(-1, 3/2)$ (c) $(2, -3)$ (d) $(-2, 3)$
9. The number of four digit numbers that can be formed with the digits 2, 3, 4, 5 and using each digit once is?
(a) 120 (b) 96 (c) 24 (d) 100
10. If it was Friday on 4 May 1964, then what was the day on 6 July 1965?
(a) Monday (b) Tuesday (c) Wednesday (d) Saturday

11. A train is running at 72 km/h crosses a pole in 6 seconds. What is the length of the train?
 (a) 100 m (b) 110 m (c) 120 m (d) 130 m
12. Two dice are thrown together, the probability that neither they show equal numbers nor the sum of the numbers on both the dice is 9 will be
 (a) 13/15 (b) 13/18 (c) 1/9 (d) 8/9
13. The domain of the function $f(x) = \sqrt{16 - x^2}$ is
 (a) R (b) R - (-4, 4) (c) [-4, 4] (d) [0, 4]
14. If $A = \{x \mid x \text{ is a positive integer, and } 2 < x < 6\}$
 and $B = \{x \mid x \text{ is a positive integer, and } -5 < x \leq 6\}$, then $A \cap B$ is
 (a) $\{2, 3, 4, 5, 6\}$ (b) $\{-4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}$ (c) $\{3, 4, 5, 6\}$ (d) $\{3, 4, 5\}$
15. The mean of 100 observations is 50 and their standard deviation is 10. If 5 is added to each observation, then the new mean and new standard deviation respectively will be:
 (a) 50, 10 (b) 55, 10 (c) 50, 15 (d) 55, 15
16. The sum of an infinite G.P. 12, 6, 3, 3/2,
 (a) 36 (b) 24 (c) 22.5 (d) Not defined
17. In a certain code language TAPE is written as 4825, SMART is written as 91834 and BONE is written as 7605, then BASERA is written as
 (a) 789198 (b) 785198 (c) 789538 (d) 789138
18. The effective annual rate of interest corresponding to a nominal rate of 8% p.a. payable half-yearly is:
 (a) 8.08% (b) 8.10% (c) 8.16% (d) 8.04%

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true but R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.
19. Assertion (A) : Length of the latus rectum of the parabola $2y^2 = 5x$ is 5 units.
 Reason (R) : Length of the latus rectum of the parabola $y^2 = 4ax$ is $4a$ units.
 (a) Both A and R are true and R is the correct explanation of A
 (b) Both A and R are true but R is not the correct explanation of A
 (c) A is true but R is false.
 (d) A is false but R is true.
20. Assertion (A) : If A and B are the two events such that $B \subset A$, then $P(A/B) = 1$.
 Reason (R) : $P(A/B) = \frac{P(A \cap B)}{P(B)}$
 (a) Both A and R are true and R is the correct explanation of A
 (b) Both A and R are true but R is NOT the correct explanation of A.
 (c) A is true but R is false
 (d) A is false but R is true

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

21. A family has two children. What is the probability that both the children are boys given that atleast one of them is a boy?

OR

If two letters are chosen at random from the English alphabet, find the probability that both are vowels?

22. Find the angle between the hands of a clock at 3:40 pm?
23. If $A = \{1, 2, 3, 4, \dots, 14\}$ and the relation R is defined from A to A by $R = \{(x, y) : 3x - y = 0, x, y \in A\}$.
- (i) Write R in roster form
- (ii) Write its domain, codomain and range.

OR

Let $U = \{x : x \in \mathbb{N}, x \leq 9\}$; $A = \{x : x \text{ is an even number}, 0 < x < 10\}$; $B = \{2, 3, 5, 7\}$.

Find $A' \cup B'$.

24. A function 'f' is defined by $f(x) = x^2 + 1$ where $x \in \{-2, -1, 0, 1, 2\}$. List the elements of f.
25. The test marks of 12 students are given as 22, 23, 25, 22, 24, 27, 28, 24, 30, 33, 24, 27. Find the percentile rank of 25 marks.

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

26. If the parabola $x^2 = 4ay$ passes through the point (6,3), then find:

- (i) Equation of parabola
- (ii) Coordinates of its Focus
- (iii) Length of its latus rectum

OR

Find the equation of the circle with centre (2,2) and which passes through the point (4,5)

27. A committee of 7 has to be formed out of 9 boys and 4 girls. In how many ways can this be done when the committee consists of
- (i) exactly 3 girls
- (ii) exactly 3 boys?

28. A function f is defined by $f(x) = \begin{cases} \frac{x^2 - x - 6}{x - 3} & , x \neq 3 \\ 5 & , x = 3 \end{cases}$, show that f is continuous at $x = 3$.

29. Find the equation of the line passing through the point (1,2) and perpendicular to the line $x + y + 7 = 0$.

30. A boy leaves for his school at 7:00 a.m He spends 6 hours 30 minutes in the school and comes back to his home at 3:00 p.m. on the same day. If he walks at a constant speed of 4 km/h, find how far is his school?

OR

The average height of 10 students is 151.8 cm. Two more students of heights 157.6 cm and 154.4 cm join the group. What is the new average height of the group?

31. Find $\frac{dy}{dx}$, if $y = \sqrt{5x^2 + 4x - 6}$

OR

Find $\frac{dy}{dx}$, if $y^2 - 3xy + x^2 = 25$

SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each)

32. Virat and Rohit are two brothers and they asked their father for the pocket money. Their father gave them two options. Either they can take Rs 2000 now or can get Rs 1 on day 1, Rs 2 on day 2, Rs 4 on day 3 and so on receiving twice as many rupees each day as the previous day for 15 days. Virat opted to take Rs 2000 now while Rohit opted the second option. Who has made a better decision and why? Explain with proper calculations.
33. Find the mean, variance and standard deviation for the following distribution by deviation method.

Marks	0-10	10-20	20-30	30-40	40-50
Number of students	5	8	15	16	6

OR

Calculate Spearman's rank correlation for the following data and then interpret the result.

Marks in Mathematics	36	48	27	36	29	30	36	39	42	48
Marks in Statistics	27	45	24	27	31	33	35	45	41	45

34. In financial year 2024-25, the annual income of Mr. Mehta (age 45 years) was Rs. 10,50,000 (exclusive of HRA). He deposited Rs 9000 per month in NPS and Rs 31,000 as LIC premium. He paid Rs 42,000 as tuition fees of his two children. He purchased a mediclaim policy of Rs 18,600. He paid Rs 1,09,000 as interest and Rs 24,500 as principal on home loan. Calculate the income tax paid by Mr. Mehta at the end of the financial year as per old tax regime. Compare it with the income tax as per new tax regime.

Income Tax Slab Under Old Tax Regime

Taxable Income	Income Tax
Upto Rs 2,50,000	NIL
Rs 2,50,000 to Rs 5,00,000	5% of taxable income exceeding Rs 2,50,000
Rs 5,00,000 to Rs 10,00,000	Rs 12,500 + 20% of taxable income exceeding Rs 5,00,000
Above Rs 10,00,000	Rs 1,12,500 + 30% of taxable income exceeding Rs 10,00,000

Income Tax Slab Under New Tax Regime

Taxable Income	Income Tax
Upto Rs 3,00,000	NIL
Rs 3,00,000 to Rs 7,00,000	5% of taxable income exceeding Rs 3,00,000
Rs 7,00,000 to Rs 10,00,000	Rs 20,000 + 10% of taxable income exceeding Rs 7,00,000
Rs 10,00,000 to Rs 12,00,000	Rs 50,000 + 15% of taxable income exceeding Rs 10,00,000
Rs 12,00,000 to Rs 15,00,000	Rs 80,000 + 20% of taxable income exceeding Rs 12,00,000
Above Rs 15,00,000	Rs 1,40,000 + 30% of taxable income exceeding Rs 15,00,000

35. Find the difference between the compound interest earned on Rs. 80000 for 2 years at the rate of 10% p.a. when compounded annually and semi-annually? [Use log table for calculations]

OR

Mr. Sharma plans to buy a car worth Rs. 10,00,000. He makes a down payment of 20% of the car price and takes a loan for the remaining amount. The loan is to be repaid in 5 years with an annual interest rate of 10%, compounded monthly. Calculate the monthly EMI, if he pays the instalments at the end of every month. [Use $(1.0083)^{60} = 1.64$]

SECTION E

(This section comprises of 3 case based questions of 4 marks each with two or three sub-parts.)

- 36. Case-Study 1:** In a class of 24 students, 16 had taken Biology, 13 had Physics and 12 had Chemistry. 6 had Biology and Chemistry, 10 had Biology and Physics and 5 had Physics and Chemistry. 4 of them had all three subjects. The school needed to find out more about the various grouping of the students in order to organize classrooms with the appropriate amount of lab kits for each subjects.

Based on the above information answer the following questions:

- (i) How many students had only Chemistry?
- (ii) How many students had only one subject?
- (iii) How many students had Biology or Physics but not Chemistry?

OR

How many students had at least two subjects?

- 37. Case-Study 2:** Ravi and Siddhartha are playing cards. The total number of cards in the deck of cards is 52. Each of them draws cards one by one.

Based on the above information, answer the following questions:

- (i) Ravi draws a card at random from the well-shuffled pack of 52 cards. Find the probability that it is either a king or a spade.
- (ii) Siddhartha draws a card from the well shuffled pack of cards, what is the probability that the drawn card is a red and a Queen?
- (iii) 4 cards are drawn by Ravi from the well-shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?

OR

If Ravi draws a card and is found to be an ace, then find the probability that next card drawn by Siddhartha is either an ace or a spade, if card drawn by Ravi is not replaced?

- 38. Case-Study 3:** A retailer buys an air conditioner for Rs 40,000 from a whole-seller at a discount of 20% on the printed price and sells it to a consumer at the printed price. The sales are intra-state and the rate of G.S.T is 12%.

Based on above information, answer the following questions:

- (i) What is the G.S.T paid by the retailer
- (ii) What is the G.S.T paid by the consumer
- (iii) The price including G.S.T, at which air conditioner was bought by the retailer

OR

The price at which the consumer bought the air conditioner.