CBSE | DEPARTMENT OF SKILL EDUCATION

APPLIED MATHEMATICS (840)

Blue-print for Sample Question Paper for Class XII (Session 2020-2021)

Max. Time: 3 Hours **Max. Marks: 70**

UNIT NO.	NAME OF THE UNIT	OBJECTIVE TYPE QUESTIONS	SHORT ANS. TYPE QUES.- I	SHORT ANS. TYPE QUES.- II	DESCRIPTIVE/ LONG ANS. TYPE QUESTIONS	TOTAL QUESTIONS
		1 MARK EACH	2 MARKS EACH	3 MARKS EACH	5 MARKS EACH	
1.	Fundamentals of Calculus	9	1	1	1	12
2.	Algebra	6	1		1	8
3.	Logical Reasoning	7	1	1		9
4.	Commercial Mathematics	7	2		1	10
5.	Probability	6	1	1	1	9
6.	Two-Dimensional Geometry	5				5
7.	Linear Programming	6	1	1	1	9
8.	Analysis of Time-Based Data	3	2			5
TOTAL QUESTIONS		**49**	**9**	**4**	**5**	
NO. OF QUESTIONS TO BE ANSWERED		**Any 35**	**Any 7**	**Any 2**	**Any 3**	
TOTAL MARKS		**1 x 35 = 35**	**2 x 7 = 14**	**3 x 2 = 6**	**5 x 3= 15**	**70**

CBSE | DEPARTMENT OF SKILL EDUCATION

APPLIED MATHEMATICS (840)

Sample Question Paper for Class XII (Session 2020-2021)

Max. Time: 3 Hours **Max. Marks: 70**

General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **25 questions** in two sections – Section A & Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. **Out of the given (7 + 18 =) 25 questions, a candidate has to answer (7 + 12 =) 19 questions in the allotted (maximum) time of 3 hours.**
5. All questions of a particular section must be attempted in the correct order.
6. **SECTION A - OBJECTIVE TYPE QUESTIONS (35 MARKS):**
   - **i.** This section has 07 questions.
   - **ii.** There is no negative marking.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.
7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (35 MARKS):**
   - **i.** This section contains 18 questions.
   - **ii.** A candidate has to do 12 questions.
   - **iii.** Do as per the instructions given.
   - **iv.** Marks allotted are mentioned against each question/part.

SECTION A: OBJECTIVE TYPE QUESTIONS

Q. 1	**Answer any 5 out of the given 7 questions(1 x 5 = 5 marks)**	
i.	If $f(x) = \begin{cases} \frac{x^2-4}{x-2}, x \neq 2 \\ k, x = 2 \end{cases}$ is continuous at $x = 2$, then $k =$ (a) 2 (b) 4 (c) 6 (d) 3	**1**
ii.	The derivative of a^x is (a) $a^x \log a$ (b) a^x (c) $\frac{a^x}{\log a}$ (d) None of these	**1**
iii.	The matrix $A = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a (a) Square matrix (b) Diagonal matrix (c) Unit matrix (d) None of these	**1**
iv.	The decimal equivalent of the binary 11010 is (a) $(29)_{10}$ (b) $(36)_{10}$ (c) $(26)_{10}$ (d) $(19)_{10}$	**1**
v.	If Rs. 100 share is quoted at 75 premium, then its market value is (a) Rs. 100 (b) Rs.175 (c) Rs. 75 (d) Rs. 125	**1**
vi.	Find the investment in buying 450 shares of Rs. 100 each at 5% discount (a) Rs. 47,250 (b) Rs.50,000 (c) Rs. 42,750 (d) Rs. 45,000	**1**
vii.	The total revenue received from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$. The marginal revenue, when $x = 15$, is (a) 116 (b) 96 (c) 90 (d) 126	**1**

Q. 2	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	If $P(A) = 0.6, P(AB) = 0.7$, A and B are independent events, then P(B) is (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) None of these	**1**
ii.	The equation of the lines parallel to $x - axis$ and passing though $(-2,3)$ is (a) $x = -2$ (b) $x = 3$ (c) $y = -2$ (d) $y = 3$	**1**
iii.	The conditions $x \geq 0, y \geq 0$ are called (a) Restrictions only (b) Non-negative restrictions (c) Negative restrictions (d) None of these	**1**
iv.	Index Numbers are expressed in (a) Ratios (b) Squares (c) Percentages (d) None of these	**1**

v.	$\lim_{x\to 0} \frac{\sqrt{1+x}-1}{x}$ is equal to (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\sqrt{2}$	**1**
vi.	If $\lim_{x\to 2} \frac{x^n-2^n}{x-2} = 32$, then the value of n is (a) 1 (b) 2 (c) 3 (d) 4	**1**
vii.	IF $y = xe^y$, then $\frac{dy}{dx}$ is (a) $\frac{y}{1-y}$ (b) $\frac{y}{x(1-y)}$ (c) $\frac{x}{1-y}$ (d) $\frac{x}{y(1-y)}$	**1**

Q. 3	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	If $f(x) = x^2 + 5x + 2$, then $f'(3)$ is (a) 11 (b) 12 (c) 10 (d) 9	**1**
ii.	$\int \frac{1}{x^2} dx$ equals (a) $\frac{1}{x} + C$ (b) $x + C$ (c) $-2x + C$ (d) $2x + C$	**1**
iii.	Total number of possible matrices of order 3×3 with each entry 2 or 0 is (a) 9 (b) 27 (c) 81 (d) 512	**1**
iv.	$A = [a_{ij}]_{m\times n}$ is a square matrix, if (a) $m < n$ (b) $m > n$ (c) $m = n$ (d) None of these	**1**
v.	If $X + Y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$, then $X =$ (a) $\begin{bmatrix} 8 & 8 \\ 0 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 4 \\ 0 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ (d) None of these	**1**
vi.	If A is of order 2×3 and B is of order 3×2, then order of AB is (a) 3×3 (b) 2×2 (c) 3×2 (d) 2×3	**1**
vii.	Find the missing term in the series: 3, 20, 63, 144, 275, ? (a) 354 (b) 468 (c) 548 (d) 554	**1**

Q. 4	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	In a certain code, TEACHER is written as VGCEJGT. How CHILDREN written in that code? (a) EJKNEGTP (b) EJKNFITP (c) EJKNFGTO (d) EJKNFTGP	**1**

ii.	A man is facing west. He turns 45^o in the clockwise directionand then another 180^o in the same direction and then 270^o in the anticlockwisedirection. Which direction is he facing now? (a) South (b) North-West (c) West (d) South-West	**1**
iii.	Choose the word which is least like the other words in the group. (a) copper (b) Zinc (c) Brass (d) iron	**1**
iv.	The equation of the line through (−2, 3) with slope −4 is (a) 4x+y+5= 0 (b) x+4y-5=0 (c) 5x+4y+4=0 (d) x+y+5=0	**1**
v.	The equation of the line joining the points (a,0) and (0, b) is (a) $ax + by = 0$ (b) $bx + ay = 0$ (c) $\frac{x}{b} + \frac{y}{a} = 1$ (d) $\frac{x}{a} + \frac{y}{b} = 1$	**1**
vi.	The point on the line $3x - y - 1 = 0$ whose ordinate is 5, is (a) (0, 4) (b) (2, 5) (c) (5, 2) (d) (-2, 5)	**1**
vii.	The equation of the line, whose perpendicular distance from the origin is 4 units and the angle which the normal makes with positive direction of x-axis is 15°, is (a) $(\sqrt{3}+1)x + (\sqrt{3}-1)y = 8\sqrt{2}$ (b) $(\sqrt{3}+1)x - (\sqrt{3}-1)y = 8\sqrt{2}$ (c) $(\sqrt{3}-1)x + (\sqrt{3}+1)y = 8\sqrt{2}$ (d) $(\sqrt{3}-1)x - (\sqrt{3}+1)y = 8\sqrt{2}$	**1**

Q. 5	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	Let A and B be two events such that P(A) = 0.6, P(B) = 0.2 and P(A/B) = 0.5, then P(A'/B') is (a) $\frac{1}{10}$ (b) $\frac{3}{10}$ (c) $\frac{3}{8}$ (d) $\frac{6}{7}$	**1**
ii.	If A and B are events such that P(A/B) = P(B/A), then (a) $A \subset B$ but $A \neq B$ (b) $A = B$ (c) $A \cap B = \phi$ (d) $P(A) = P(B)$	**1**
iii.	A man throws a fair coin a number of times and gets two points for each head he throws and 1 point for each tail he throws. The probability that he gets exactly 6 points is (a) $\frac{21}{32}$ (b) $\frac{23}{32}$ (c) $\frac{41}{64}$ (d) $\frac{43}{64}$	**1**
iv.	Out of 100 bicycles, 10 bicycles have punctures. What is the probability of not having any punctured bicycle in a sample of 5 bicycles? (a) $\frac{1}{2^5}$ (b) $\frac{1}{2^9}$ (c) $\left(\frac{9}{10}\right)^5$ (d) $\frac{1}{10^5}$	**1**

v.	The corner points of the feasible region determined by the following system of linear inequalities: $2x + y \leq 10, x + 3y \leq 15, x, y \geq 0$ are (0, 0), (5, 0), (3, 4) and (0, 5). Let $Z = px + qy$, where $p, q > 0$. Conditions on p and q so that maximum of Z occurs at both (3, 4) and (0, 5) is (a) $p = q$ (b) $p = 2q$ (c) $p = 3q$ (d) $q = 3p$	**1**
vi.	Objective function of a L.P.P. is (a) A constraint (b) A function to be optimized (c) A relation between the variables (d) None of these	**1**
vii.	Uses of index number is I. Economic Barometer II. Measure the purchasing power of money III. Helps in framing suitable policies (a) Only I is true (b) Only II is true (c) All are true (d) None is true	**1**

Q. 6	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	The minimum value of $P = 6x + 16y$ subject to the constraints $x \leq 40, y \geq 20$ and $x, y \geq 0$ is (a) 240 (b) 320 (c) 0 (d) None of these	**1**
ii.	The maximum value of $P = 40x + 50y$ subject to the constraints $3x + y \leq 9, x + 2y \leq 8, x \geq 0$ and $y \geq 0$ is (a) 120 (b) 230 (c) 200 (d) None of these	**1**
iii.	A person invests Rs. 20,000 at 20 %, Rs. 150 shares at a premium of Rs. 50. The income from these shares in Rs. is (a) 1,000 (b) 3,000 (c) 1,500 (d) 2,000	**1**
iv.	The total investment made in buying Rs. X shares at a premium of 25 % is Rs. 125 X. The number of shares bought is (a) 500 (b) 250 (c) 125 (d) 100	**1**
v.	Ramesh opens a Saving Bank Account on 16.06.2007 with a deposit of Rs. 700. He deposited Rs. 1,500 on 07.07.2007. find the amount on which he would receive the interest at the end of July, 2007 (a) Rs. 700 (b) Rs. 1,500 (c) Rs. 2,200 (d) Rs. 800	**1**
vi.	Indian GST model has ____ rate structure (a) 3 (b) 4 (c) 5 (d) 6	**1**

vii.	A fan is sold for Rs. 900 cash payment of Rs. 200 down payment followed by two equal monthly installments of each Rs. 375. The annual rate of interest is ____ (approximately) (a) 25 % (b) 30 % (c) 54 % (d) 59 %	**1**

Q. 7	**Answer any 5 out of the given 7 questions (1 x 5 = 5 marks)**	
i.	Mother, Father and Son line up at random for a family picture. E: Son on one end F: Father in middle then$P\left(\frac{E}{F}\right)$is (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$	**1**
ii.	The maximum value of $Z = 5x + 10y$ subject to the constraints $x - y \leq -1, -x + y \leq 0, x \geq 0$ and $y \geq 0$ is (a) 1 (b)-10 (c) 2010 (d) No value	**1**
iii.	The Price Relative (Simple Index Number) based on 1998 for the year 1990 from the following data: Year: 1988 1989 1990 1991 1992 1993 Price (in Rs.): 120 140 150 165 175 240 is (a) 120.0 (b) 125.0 (c) 122.0 (d) 126.0	**1**
iv.	Choose the number of pair group which is different from others (a) $55 - 66$ (b) $32 - 48$ (c) 63-77 (d) 64-80	**1**
v.	If $f(x) = 1 - x + x^2 - x^3 + \cdots - x^{99} + x^{100}$, then$f'(1)$ is (a) 150 (b) 50 (c) -150 (d) -50	**1**
vi.	If $n = p$, then find the order of the matrix $7X - 5Y$, where X and Y are of order $2 \times p$ and $2 \times n$ (a) $p \times 2$ (b) $2 \times n$ (c) $n \times 3$ (d) $p \times n$	**1**
vii.	In the series 7, 14, 28, ..., the 10th term is (a) 1792 (b) 2456 (c) 3584 (d) 4096	**1**

SECTION B: SUBJECTIVE TYPE QUESTIONS

Answer any 7 out of the given 9 questions in (2 x 7 = 14 marks)

Q. 8 (2)

The cost function for the manufacture of x number of goods by a company is

$$C(x) = x^3 - 9x^2 + 24x$$

Find the level of output at which the marginal cost is minimum.

Q. 9 (2)

A company issued shares at 10% premium Satish applied for1000 shares but was allotted 500 shares of this company. Find his investment if the face value of a share is Rs. 100.

Q. 10 (2)

A die is thrown twice and sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4has appeared at least once?

Q. 11 (2)

Rs. 10,00,000.00 is taken loan at the interest rate 11 % per annum. Calculate the EMI paid every month if the loan period is 15 years.

Q. 12 (2)

Solve the following linear programming problems graphically. Maximize $Z = 4x + y$
Subject to $x + y \leq 50, 3x + y \leq 90, x \geq 0, y \geq 0$

Q. 13 (2)

From the following data, construct price Index number for 1998 taking 1996 as the base year:

Commodity	Price in 1996 (in Rs.)	Price in 1998 (in Rs.)
A	50	90
B	40	70
C	80	120
D	110	150
E	20	30

Q. 14 (2)

From the following data construct price Index number for 1997 taking 1995 as the base by simple aggregative method using Arithmetic Mean:

Commodity	Price in 1995 (in Rs.)	Price in 1997 (in Rs.)
A	50	70
B	40	60
C	80	90
D	110	120
E	20	20

Q. 15 (2)

Evaluate $(1101)_2 \times (11)_2$.

Q. 16 (2)

Find non-zero values of x satisfying the matrix equation:

$$x\begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix} + 2\begin{bmatrix} 8 & 5x \\ 4 & 4x \end{bmatrix} = 2\begin{bmatrix} x^2 + 8 & 24 \\ 10 & 6x \end{bmatrix}$$

Answer any 2 out of the given 4 questions (3 x 2 = 6 marks)

Q. 17	Three persons A, B, C throw a dice in succession till one gets a 'six' and wins the game. Find the respective probabilities of their winning.	**3**
Q. 18	Convert the decimal number 27.1875 to its binary equivalent.	**3**
Q. 19	If the total revenue received (in Rs.) from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$, find the marginal revenue, when $x = 5$.	**3**
Q. 20	Maximize $Z = 2.50x + y$, subject to $x + 3y \leq 12, 3x + y \leq 12$ and $x, y \geq 0$.	**3**

Answer any 3 out of the given 5 questions (5 x 3 = 15 marks)

Q. 21	Find the derivative of f from first principal $f(x) = x + \frac{1}{x}$.	**5**
Q. 22	If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, find $A^2 - 5A + 4I$ and hence find a matrix X such that $A^2 - 5A + 4I$+X=0.	**5**
Q. 23	The marked price of an article is Rs. 50,000. The wholesaler allows a discount of 10 % to a shopkeeper. The shopkeeper sells the article to a consumer at 4 % above the marked price. If the sales are intra-state and the rate of GST is 10 %, find (i) The amount inclusive of tax (under GST) which the shopkeeper pays for the article. (ii) The amount paid by the consumer for the article. (iii) The amount of tax (under GST) paid by shopkeeper to Central Government.	**5**
Q. 24	A bag contains 3 white and two black balls and another bag contains 2 white and 4 black balls. One bag is chosen at random. From the selected bag, one ball is drawn. Find the probability that the drawn ball is white.	**5**
Q. 25	Maximize the profit $Z = 1000x + 600y$ subject to $x + y < 200, x \geq 20, 4x \leq y$ and $x, y \geq 0$.	**5**