



# Indian School Al Wadi Al Kabir

## Assessment - 1

### APPLIED MATHEMATICS (241)

Class: XII

Date: 29.09.2022

Max Marks: 80

Time: 3 hr

#### General Instructions:

1. This question paper contains five sections A, B, C, D and E. Each section is compulsory.
2. Section - A carries 20 marks weightage, Section - B carries 10 marks weightage, Section - C carries 18 marks weightage, Section - D carries 20 marks weightage and Section - E carries 3 case-based with total weightage of 12 marks
3. **Section A:** It comprises of 20 MCQs of 1 mark each
4. **Section B:** It comprises of 5 VSA type questions of 2 marks each
5. **Section C:** It comprises of 6 SA type of questions of 3 marks each
6. **Section D:** It comprises of 4 LA type of questions of 5 marks each
7. **Section E:** It has 3 case studies. Each case study comprises of 3 case-based questions, where 2 VSA type questions are of 1 mark each and 1 SA type question is of 2 marks. Internal choice is provided in 2 marks question in each case-study.
8. Internal choice is provided in 2 questions in Section - B, 2 questions in Section – C, 2 questions in Section - D. You have to attempt only one of the alternatives in all such questions

#### SECTION – A

(All questions are compulsory. Each Question Carries 1 Mark

No internal choice is provided in this section)

- 1 What time will it be after 200 hours, if the present time is 5:00 am?  
a) 5:00am                      b) 5:00pm                      c) 1:00am                      d) 9:00pm
- 2 Find the remainder when  $226 \times 369 \times 122 \times 461 \times 1025$  is divided by 8.  
a) 2                                      b) 4                                      c) 5                                      d) 6
- 3 A container contains 40 litre milk. From this container 4 litre milk was taken out and replaced with water. This process was repeated further two more times. How much milk is there in the container now?  
a) 21.69 litre                      b) 26.91 litre                      c) 29.16 litre                      d) 26.19 litre
- 4 In a 1000 metres race. **A**, **B**, and **C** get the gold, silver and bronze medals respectively. If **A** beats **B** by 100 metres and **B** beats **C** by 100 metres, then by how many metres does **A** beat **C**?  
a) 200m                                      b) 195m                                      c) 190m                                      d) 100m
- 5 Irregular variations in a time series are caused by  
a) Lockouts and strikes                      b) Epidemics  
c) Floods                                      d) All the above
- 6 Solution of the differential equation:  $y \cdot \log y \, dx - x \, dy = 0$   
a)  $y = e^{cx}$                                       b)  $x = e^{cy}$                                       c)  $y = e^x + C$                                       d) None of these



**Directions:** In the following 2 questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

- (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 and R is True

- 19 Assertion (A): If A is a square matrix such that  $A^2 = A$ , then  $(I + A)^2 - 3A = I$   
Reason (R):  $AI = IA = A$   
(A) (B) (C) (D)

- 20 Assertion (A):  $\begin{bmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{bmatrix}$  is a scalar matrix.  
Reason (R): If all the elements of the principal diagonal are equal, it is called a scalar matrix  
(A) (B) (C) (D)

### SECTION – B

(All questions are compulsory. Each Question Carries 2 Mark  
In case of internal choice, attempt any one question only)

- 21 In a 600 meters race, A beats B by 37.5 meters or by 10 Seconds. Find the time taken by B to finish the race.
- 22 Find the values of a, b, c, and d from the following equation:  
$$\begin{bmatrix} 4 & 24 \\ -3 & 11 \end{bmatrix} = \begin{bmatrix} 2a + b & 4c + 3d \\ a - 2b & 5c - d \end{bmatrix}$$
- 23 A person can row a boat 5 km an hour in still water. It takes him thrice as long to row upstream as to row downstream. Find the rate at which the stream is flowing.
- 24 A wire 40 m length is to be cut into two pieces. One of the pieces is to be made into a square and the other into a circle. What should be the lengths of the two pieces so that the combined area of the square and the circle is minimum?

**- OR -**

The demand function for a commodity is  $p = 35 - 2x - x^2$ . Find the consumer's surplus at equilibrium price  $p_0 = 20$

- 25 Find slope of the tangent and normal at a point (2,6) to the curve  $y = x^3 - x$

**- OR -**

Evaluate  $\int_1^3 \frac{\sqrt[3]{x}}{\sqrt[3]{x} + \sqrt[3]{4-x}} dx$

## SECTION – C

(All questions are compulsory. Each Question Carries 3 Mark.

In case of internal choice, attempt any one question only)

- 26 The amount of radiocarbon present after  $t$  years is given by  $A = A_0 e^{\left(\frac{-t \log 2}{5700}\right)}$  where  $A_0$  is the amount present in the living plants and animals. Find the half-life of radiocarbon.

- OR -

Mr. Ashwin deposited ₹ 20,000 in a bank that pays 8% interest compounded continuously.

- a) How much amount will she get after 10 years? ( $e^{0.8} = 2.23$ )
- 27 Two badminton teams A and B are staying in the same hotel. Team A has 2 male and 3 female players accompanied by 1 coach. Team B comprises of 1 male, 2 female players and 2 coaches. The daily diet requirement (calories and protein) for each person is as given below. Use matrix algebra to calculate the total diet requirement of calories and protein for each team.

	Calories	Protein
Male Player	2500	65g
Female Player	1900	50g
Coach	2000	54g

- 28 Three varieties A, B and C of tea are mixed together in the ratio 1:1:3 respectively. The price of tea A is ₹ 127 per Kg and that of tea B is ₹ 135 per Kg. If the price of the mixture is ₹ 152 Kg, then find the price per Kg of tea C.
- 29 A cistern can be filled by two pipes A and B in 12 minutes and 15 minutes respectively. Another tap C can empty the full tank in 20 minutes. If the tap C is opened 5 minutes after the pipes A and B are opened, find when the cistern becomes full?
- 30 Solve the following system of equations using Cramer's rule  
 $x + y + z = 10$ ,  $2x + y = 13$ ,  $x + y - 4z = 0$

- 31 Calculate the 3 years moving average of the following data

Year	2000	2001	2002	2003	2004	2005	2006
Value	2	4	5	7	8	10	13

- OR -

Obtain the 5 years moving average for the following series of observations

Year	2007	2008	2009	2010	2011	2012	2013	2014
Annual Sale (in Rs)	3.6	4.3	4.3	3.4	4.4	5.4	3.4	2.4

## SECTION – D

(All questions are compulsory. Each Question Carries 5 Mark.

In case of internal choice, attempt any one question only)

32 Solve the following

(i) If  $x^m \cdot y^n = (x + y)^{m+n}$ , then show that  $\frac{dy}{dx} = \frac{y}{x}$

(ii) Find  $\frac{d^2y}{dx^2}$  if the function  $y = \sqrt{x^2 - 1}$

33 A cake is taken out from an oven when its temperature has reached  $185^\circ\text{F}$  and is placed on a table in a room whose temperature is  $75^\circ\text{F}$ . If the temperature of the cake reaches  $150^\circ\text{F}$  after half an hour, what will be its temperature after 60 minutes?

- OR -

In a certain culture of bacteria, the rate of increase is proportional to the number present. It is found that there are 10,000 bacteria at the end of 3 hours and 40,000 bacteria at the end of 5 hours. How many bacteria were present in the beginning?

34 Evaluate:  $\int \frac{3x-2}{(x+1)(x-2)^2} dx$

35 Fit a straight line trend by the method of least squares for the following data. Also tabulate the trend value

Year	2004	2005	2006	2007	2008	2009	2010
Profit (In Rs)	6	5	4	6	5	7	5

- OR -

Fit a straight line trend by the method of least squares for the following data. Also tabulate the trend value

Year	1995	1996	1997	1998	1999	2000
Sales (In Rs Corers)	16	32	28	44	36	24

## SECTION – E (Case Study)

(Each Question Carries 4 Marks.

Internal choice is provided to Question no (iii) in each case-study)

36 To promote the making of toilets for women, an organization tried to generate awareness through a) house calls b) emails c) announcements. The cost for each mode per attempt is given below:

a) ₹ 50    b) ₹ 20    c) ₹ 40

	(i)	(ii)	(iii)
X	400	300	100
Y	300	250	75
Z	500	400	150



The number of attempts made in the village X, Y, Z are given. Also, the chance of making of toilets corresponding to one attempt of given modes is

- a) 2%    b)4%    c)20%

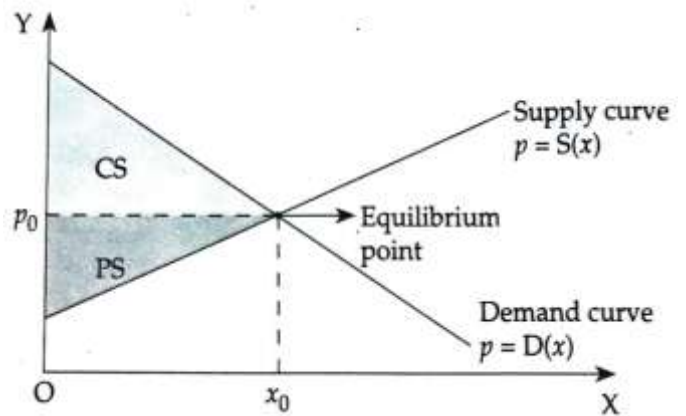
Based on the above information, answer the following questions:

- (i) How much is the cost incurred by the organization on village X
- (ii) How much is the cost incurred by the organization on village Y is
- (iii) How many toilets can be expected after the promotion in village X

- OR -

How many toilets can be expected after the promotion in village Z is

- 37 The graph given showing the demand and supply curves of a mobile phone company are linear. When the price of a mobile phone was ₹16000 per unit, Singh mobiles sold 20 units every month and when price dropped to ₹10000 per unit, Singh mobiles sold 80 units every month. When the price was 16000 per unit, 155 mobiles were available per month for sale and when the price was only ₹10000 per unit, 35 mobiles remained.



Based on the above information, answer the following questions:

- (i) Write the demand function
- (ii) Write the supply function
- (iii) Find the Consumer Surplus

- OR -

Find the producer Surplus

- 38 Read the following text and answer the following questions. On the basis of the same:

An open box is to be made out of a piece of cardboard measuring  $(24 \text{ cm} \times 24 \text{ cm})$  by cutting of equal squares from the corners and turning up the sides.

- (i) Find the volume of that open box?
- (ii) Find the value of  $\frac{dv}{dx}$
- (iii) Find the value of  $\frac{d^2v}{dx^2}$

- OR -

Find the values of 'x'

