Sample Question Paper (Set-1)
CLASS: XII Session: 2022-23
Applied Mathematics (Code-241)

Maximum Marks: 80   **Time Allowed: 3 hrs**

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.

Section – A

3. It comprises of 20 MCQs of 1 mark each.

Section – B

4. It comprises of 5 VSA type questions of 2 marks each.

Section – C

5. It comprises of 6 SA type of questions of 3 marks each.

Section – D

6. It comprises of 4 LA type of questions of 5 marks each.

Section – E

7. 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

Q.1	What is the least value of 'x' that satisfies $x \equiv 17(\text{mod } 4)$, when $18 < x \leq 25$? (a)17 (b)21 (c)25 (d) Not defined	1
Q.2	If a =31 , m=5 and $a \equiv b \pmod{m}$ is true then value of 'b'. (a)21 (b)31 (c)16 (d) All of these	1
Q.3	If 'p' and 'q' are two positive quantities than p+q ------ p – q ; fill this blank with suitable inequality symbol . (a)> (b)< (c)≥ (d)≤	1
Q.4	In what ratio water should added to the liquid detergent costing ₹480 per litre to get resulting mixture worth ₹300 per litre? (a)5:3 (b)3:8 (c) 3:5 (d) 5:8	1
Q.5	Construct a matrix of order 2X2 whose elements are given by $a_{ij} = |i - j|$. (a) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	1
Q.6	If A = $\begin{bmatrix} 3 & p \\ 7 & 5 \end{bmatrix}$ then what should be the value of p for which A is symmetric ? (a)0 (b) -7 (c) 5 (d) 7	1
Q.7	If A is a square matrix of order 3X3 and |A|= 3 then calculate |2A| . (a) 24 (b) 6 (c) 18 (d) None of these	1
Q.8	Find $\frac{d^2y}{dx^2}$ if $y = x$. (a)1 (b) 0 (c) x (d) -1	1
Q.9	Evaluate : $\int \frac{x+3}{x+5} dx$. $(a) x + \log\|x - 5\|$ $(b.) x - 2\log\|x - 5\|$ $(c.) x - 2\log\|x - 3\|$ $(d) x - \log\|x + 3\|$	1
Q.10	Find the value of k from the following table <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>P(X)</td><td>0.1</td><td>k</td><td>2k</td><td>2k</td><td>k</td></tr></table>(a)1 (b) 0 (c) 0.15 (d) 1.5	1
Q.11	If a die is thrown 6 times and getting even number is success then calculate probability of getting exactly 2 success.	1

	(a)15/32	(b) 15/64	(c) 3/64	(d) 10/23	
Q.12	Find the mean and variance from Binomial distribution B(4,1/3) (a)4 ,1/3 (b) 16,1/9 (c) 4/3 , 8/3 (d) 4/3 , 8/9				1
Q.13	For a Poisson distribution mean and variance are 3 and 4 respectively . Is this statement (a)Incorrect (b) Correct (d) Can't say (d) data is insufficient				1
Q.14	A marketing company is going to promote its number of departmental stores by campaigning . Then what is Null Hypothesis ? (a)Mean(μ_a) before campaign = Mean(μ_b) after campaign (b) Mean(μ_a) before campaign = 0 (c) Mean(μ_a) before campaign > Mean(μ_b) after campaign (d) Mean(μ_b) after campaign = 0				1
Q.15	A set of observations recorded at an equal interval of time is called (a)Array data (b) data (c) Geometric Series (d) Time series data				1
Q.16	How many components of Time series data have ? (a)0 (b) 1 (c)3 (d) 6				1
Q.17	The best fitted trend line is one for which sum of squares of residuals or errors is (a)positive (b) negative (c) minimum (d)maximum				
Q.18	Calculate present value of a sequence of payment ₹60 made at end of each 6 months and continuing forever, if money is worth 4% compounded semi-annually . (a)₹ 3000 (b))₹ 1000 (c))₹ 300 (d0)₹ 360				
	For questions 19 and 20, two statements are given – one labelled 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 R are true and R is the correct explanation of the assertion (ii)Both A and R are true but R is not the correct explanation of the assertion (iii) A is true, but R is false (iv) A is false, but R is true				
Q.19	Assertion (A) : If the nominal rate of interest is 12.5% and the inflation is 2%, then the effective rate of interest is 10.5% Reason (R) : If the interest is calculated only at the end of an year, then the effective rate of interest is same as the nominal rate of interest. a) (i) b) (ii) c) (iii) d) (iv)				1
Q.20	Assertion (A) : Feasible region is the set of points which satisfy all of the given constraints. Reason (R): The optimal value of the objective function is attained at the points on X-axis only. a) (i) b) (ii) c) (iii) d) (iv)				1

SECTION-B

Q.21	Solve the differential equation $(1 + x^2)d - (1 + y^2)dx = 0$ OR Find the general solution of $\frac{dy}{dx} = e^{x+y}$.	2
Q.22	From a lot of 10 bulbs 2 are defective ; find probability distribution of number of 2 bulbs.	2
Q.23	How much money is needed to endure a series of lectures costing ₹2500 at the beginning of each year indefinitely , if money is worth 3 % compounded annually ?	2
Q.24	Mr.Anil has an initial investment of ₹50,000 in an investment plan after 2 years it has grown to ₹60,000. Find his rate of interest. OR Mr X takes a loan of ₹ 2,00,000 with 10% annual rate for 5 years . Calculate EMI under Flat rate system.	2
Q.25	Minimise Z = 3x+4y subjected to constraint x+y≤ 4 ; x ≥ 0 ; y≥ 0	2

SECTION-C

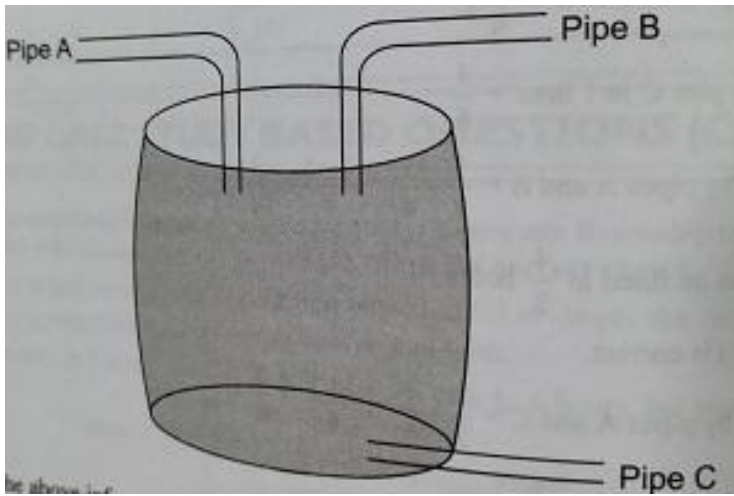| Q.26	A motor boat whose speed is 18 km/h in still water takes 1 hr more to go 24 km upstream than to return downstream to same spot . Find the speed of the stream .	3
Q.27	Three shopkeepers A,B and C go to a store to buy stationary. A purchase 12 dozen	3

	notebooks, 5 dozen pens and 6 dozen pencils. B purchase 10 dozen noteboks , 6 dozen pens and 7 dozen pencils. C purchase 11 dozen noteboks , 13 dozen pens and 8 dozen pencils.A notebook cost 40 paise , a pen costs ₹1.25 and pencil costs 35 paise . Use matrix multiplication to calculate the indicidual's bill. OR Prove that $det.\begin{bmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{bmatrix} = (a+b+c)^3$	
Q.28	Find the equation of the tangent to the curve at point(s) where the tangent to the curve $y = 2x^3 - 15x^2 + 36x - 21$ is parallel to x-axis. OR Find the intervals in which the function $f(x) = 2x^3 - 9x^2 + 12x + 15$ is strictly increasing or decreasing.	3
Q.29	Evaluate : $\int \frac{(2x+1)}{(x+1)(x-2)}\, dx$	3
Q.30	An IQ test was administered to 5 persons before and after they were trained . the results are given below:	3

Candidates	I	II	III	IV	V
IQ before training	110	120	123	132	125
IQ after training	120	118	125	136	121

Test whether there is any change in IQ after the training programme .

Q.31	Fit a straight line trend to the following data and estimate value for 2016 :	3

Year	2010	2011	2012	2013	2014	2015
Values	28	32	29	35	40	50

SECTION-D

Q.32	An open tank with the square bottom is to contain 400 cubic cm of liquid is to be constructed. Find the dimensions of the tank so that the surface area of the tank is minimum.	5
Q.33	If the level of education among adults in a certain region is normaly distributed with mean 8 and S.D 5 , what is probability that in a sample of 100 adults, you wil find an average level of education . (i)Between 10 to 14 years (ii) more than 14 years OR It is known that 3% of plastic buckets manufactured in a factory are defective. Using the Poisson distribution on a sample of 100 buckets, find the probability of: (i) Zero defective buckets (ii) At most one bucket is defective [Use $e^{-3} = 0.049$]	5
Q.34	A loan of ₹2,50,000 at the interest rate of 6% p.a. compounded monthly is to be amortized by equal payments at the end of each month for 5 years, find (i) The size of each monthly payment. (ii) The principal outstanding at beginning of 40th month. (iii) Interest paid in 40th payment. (iv) Principal contained in 40th payment (v) Total interest paid. (Given (1.005) 60 = 1.3489, (1.005) 21 =1.1104)	5
Q.35	Maximize Z= 22x+44y subjected to constraints $x + y \geq 3$, $3x + 8y \leq 24$, $x - y \geq 0$, $x, y \geq 0$. OR Solve the following Linear Programming Problem using ISO-Cost method. Minimize Z = 18x + 10y Subject to 4x + y ≥ 20, 2x + 3y ≥ 30, x ≥ 0 and y ≥ 0.	5

SECTION-E

Q.36	A pipe is connected to a tank or cistern . It is used to fill or empty the cistern. The amount of work done by a pipe is a part of the tank filled or emptied in unit time. Three pipes A, B and C are connected to a tank. A and B fill the tank in 6 and 8 hours respectively when operated independently. Pipe C empties the full tank in 12 hours when opened alone. Based on the above information , answer the following questions : (i)If both pipes A and B are opened together , then the tank can be filled in (ii)If pipe A and C are opened together , then the tank can be filled in (iii)If pipe B and C are opened together, then the tank can be filled in OR Three pipes are opened together then the tank can be filled in	1+1+2
Q.37	Three schools DPS , CVC and KVS decided to organise a fair for collecting money for helping the flod victims. (ref: google images) They sold handmade fans , mats and plates from recycled material at a cost of ₹ 25 , ₹ 100 and ₹50 each respectively. The number of articles sold are given as : (table below) (i)What is total money (in ₹)collected by the schools DPS ? (ii)What is total amount of money(in ₹)collected by the schools CVC and KVS ? (iii) What is total amount of money(in ₹)collected by the all schools ? OR How many articles(in total) are sold by three schools ?	1+1+2
Q.38	In the year 2000, Ms. Neelamplanned to purchase a home. She took a **home loan** of ₹	1+1+2

Table for Q.37:

School/Article	DPS	CVC	KVS
Handmade fans	40	25	35
Mats	50	40	50
Plates	20	30	40

3000000 from the State Bank of India at 7.5% p.a. compounded monthly for 20 years.

(https://www.google.com/search?q=HOME&source)

Based on the above information, answer the following questions:

(i)What is the principal outstanding at the beginning of 193rd month?

(ii)What is the interest paid by Ms. Neelamin the 150th payment?

(iii)What is the total interest paid by Ms. Neelam?

OR

What is the equated monthly instalment paid by Ms. Neelam?