SAMPLE QUESTION PAPER - 2022_23 (SET-2)
CLASS -XII
TIME: 3 Hrs **SUB: APPLIED MATHEMATICS** **M.M.: 80**

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 Shirt Answers (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

1.	What is the value of $7^6 (mod\ 3)$ (a) 1 (b) 2 (c) 3 (d) 4	1
2.	The value of - 31mod 7 will be (a) 1 (b) 2 (c) 3 (d) 4	1
3.	In an examination out of 1000 students, 70% boy and 80% girls are passed . If total pass percentage is 76%, then the number of girls is (a) 500 (b) 600 (c) 700 (d) 800	1
4.	A certain tank can be filled by pipe A in 12 minutes . pipe B can empty the tank in 18 minutes . If both pipes are open ,then the time it takes to fill the tank (a) 5 minutes (b) 6.4 minutes (c) 7.2 minutes (d) 8.5 minutes	1
5.	The matrix $[0\ 1\ -1\ 0]$ is (a)a unit matrix (b) a symmetric matrix (c) a skew symmetric matrix (d) a diagonal matrix	1
6.	If $[a+b\ 2\ 5\ b] = [6\ 5\ 2\ 2]^T$, then a is (a) 4 (b) 3 (c) 2 (d) 1	1
7.	If A is 3x3 matrix such that $\|A\|$=8 , then $\|3A\|$ is equals (a) 24 (b) 72 (c)216 (d) 8	1
8.	If x=3at, y=at^3 , then $\frac{dy}{dx}$ is equal to (a)3 (b)3a (c) 3at (d) t^2	1
9.	The radius of a circle is increasing at the rate of 0.7cm/s. Then the rate of increase of its circumference is (a) 1.4π cm/s (b) 2.4 cm/s (c) 0.4 cm/s (d) -0.4 cm/s	1
10.	The total revenue in Rupees received from the sale of x units of a product is given by R(x)= 3t^2+36x+5. The marginal revenue , when x=15 is: (a)116 (b) 96 (c) 90 (d)126	1
11.	The probability distribution of a discrete random variable X is given below :	1

X	2	3	4	5
P(X)	5/k	7/k	9/k	11/k

	The value of k is (a) 8 (b) 16 (c) 32 (d) 48	
12.	Consider the following hypothesis test H_0 : μ ≤ 25 H_a : μ > 25 A sample of 40 provided a sample mean of 26.4, then the value of the test statistics is: (a) 4.18 (b)-1.48 (c) 1.48 (d)-4.18	1
13.	A specific characteristic of a population is known as a (a) a sample (b) parameter (c) statistic (d) mean	1
14.	Which of the following cannot be a component for a time series (a) seasonality (b) trend (c)cyclical (d) none of these	1
15.	Seasonal variation mean the variations occurred within (a) A number of years (b) parts of a year (c) parts of a month (d) none of these	1
16.	Time series data have a total number of components ? (a) 3 (b) 4 (c)5 (d)6	1
17.	Mr. Anil takes a loan of Rs. 2,00,000 with 10% annual interest rate for 5 years. EMI under flat rates system is (a) 4000 (b) 5000 (c) 6000 (d)7000	1
18.	At what rate of interest will the present value of a perpetuity of Rs. 500 payable at the end of every 6 months be Rs. 10000? (a) 6 (b) 8 (c)5 (d)10	1
19.	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) Both A and R are true and R is the correct explanation ofr 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.	1
20.	Assertion (A): The function y=$[x(x-2)]^2$ is increasing in (0,1) U (2,∞) Reason (R): $\frac{dy}{dx} = 0$, when x=0,1,2 (a) Both A and R are true and R is the correct explanation ofr 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.	1

SECTION B

21	Find the value of x, given that $x \equiv 23(mod\ 7)$; if $21 \leq x < 31$	2
22	In a 500 m race, A defeats B by 60 meters (or) 12 seconds. What is the time taken by A to complete the race? **OR** A pump can fill a tank with water in 2 hours. Because of a leak in the tank, it takes $2\frac{1}{3}$ hours to fill the tank. The leak will be empty the filled tank in what time?	2
23	Using determinant find the value of k, for which points P (3,-2), Q (8, 8) and R (k, 2) are collinear.	2
24	A person has an initial investment of Rs. 50000 in an investment plan. After 2 years it has grown to Rs 60000. Find his rate of return.	2
25	A small firm manufactures necklaces and bracelets. The total number of necklaces and bracelets that it can handle per day is at most 24. It takes one hour to make a bracelet and half an hour to make a necklace. The maximum number of hours available per day is 16.	2

	If the profit on a necklace is Rs 100 and that on a bracelet is Rs.300. Formulate a L.P.P. for finding how many of each should be produced daily to maximise the profit?	

SECTION C

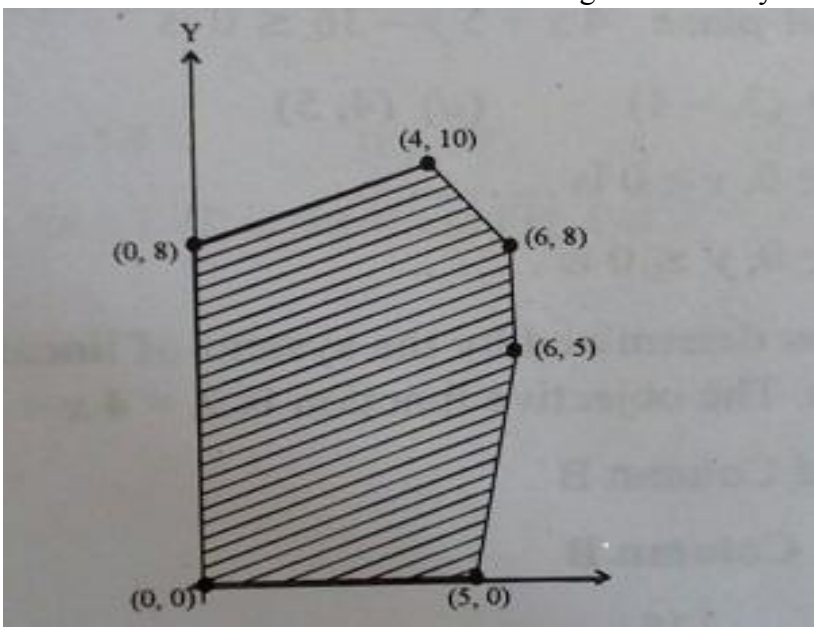
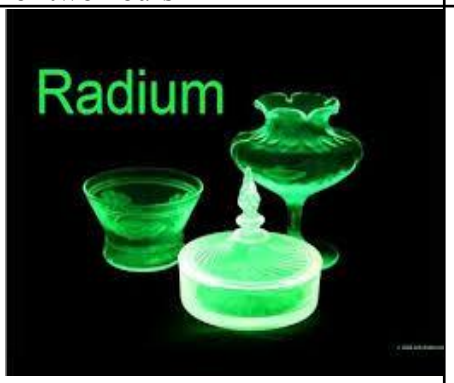
26.	A man can row a boat at 5 km/h in still water. If the speed of water current in a river is 1 km/h and it takes him 1 hour to row to a place and come back, how far off is the place? **OR** A vessel contains a mixture of two liquids P and Q in the ratio 5:7. 12 litres of mixture drawn off from the vessel and 12 L of liquid P is filled in the vessel. If the ratio of the liquids P and Q becomes 9:7, how many litres of liquids P and Q were contained by the vessel initially.	3
27.	A vehicle costing Rs. 900000 has a scrap value of Rs. 270000. If the annual depreciation charge is Rs. 70000, Find its useful life in years.	
28.	Calculate the 3 yearly moving averages from the following time series: Year: 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 Earnings: (Rs Lakhs): 3.6, 4.3, 4.3, 3.4, 4.4, 5.4, 3.4, 2.4	3
29	Find the present value of a perpetuity of Rs 3120 payable at the beginning of each year , if money is worth 6% effective.	3
30	Find the intervals in which the function is $f(x) = 2x^3 + 9x^2 + 12x + 20$ (1) increasing (2) decreasing **OR** If a manufacturer's total cost function C is given by C= $\frac{x^2}{25} + 2x$, find (i) average cost function (ii) the marginal cost function, and (iii) the marginal cost when 5 units are produced. Also, interpret the result.	3
31	A company has been producing steel tubes of mean inner diameter of 2 cm. A sample of 10 tubes gives an inner diameter of 2.01 cm and a variance of .004 cm^2. Is the difference in the values of means significant? (Given $t_9(.05) = 2.262$)	3

SECTION D

32.	The cost of 4 kg. onion, 3 kg. wheat and 2 kg. rice is 60. The cost of 2 kg. onion, 4 k wheat and 6 kg. rice is 90. The cost of 6 kg. onion, 2 kg. wheat and 3 kg. rice is 70. Find cost of each item per kg. by matrix method.	5
33.	Integrate: $\frac{3x-2}{(x+1)(x-2)^2}$ w.r.t x **OR** Integrate : $\int_1^4 \|x - 5\| \, dx$	5
34.	Mr. Naresh has bought 200 shares of City Look Company at 100 each in 2015. After selling them he has received 30000 which accounts for 22.47% CAGR. Calculate the number of years for which he was holding the shares.	5
35.	If 5% of the electric bulbs manufactured by a company are defective , use Poisson distribution to find the probability that in a sample of 100 bulbs : (1) None is defective (2) 5 bulbs will be defective **OR**	5

	In an examination, 2000 students appeared and the mean of the normal distribution of marks is 30 with standard deviation as 6.25. Find out how many students are expected to score (1) between 20 and 40 marks (2) less than 25 marks	

SECTION-E(CASE BASED QUESTIONS)

36.	The feasible solution for a LPP is shown in fig. Let Z=3x-4y be the objective function.  	4
	(i) At what point , Z attains min value. (ii) Find the minimum value of Z. (iii) At what point , Z attains max. value. OR (iii) Find the maximum value of Z.	
37.	Let X denote the number of hours you study during a randomly selected school day. The probability that X can take the value x , has the following form, where k is some constant. P(X=x) = $\{0.1 \quad , if\ x = 0\ kx, \quad if\ x = 1\ and\ x = 2\ k(5 - x), \quad if\ x = 3\ and$ Based on the above information answer the following: (i) Calculate the value of k (ii) Calculate the probability P (Studies for three hours) (iii) What is the probability when you study exactly two hours. **OR** (iii) Compute the probability when you study at least for two hours	4
38.	Radium decomposes at a rate proportional to the quantity of radium present. Suppose that it is found that in 25 years approximately 1.1 % of a certain quantity of radium has decomposed. Based on the above information answer the following questions: (i)Formulate the differential equation for the amount of radium decomposed in time t. (ii)If p and q denotes the order and degree of the differential equation in (1) respectively. find $2p + 3q$.  **Courtesy: google** (iii)Write the expression for the amount of radium decomposed in time t and the amount of radium present at t=0 **OR**	

	(iii)Compute the value of proportionality constant appearing in the differential equation of part (i).	