INDIAN SCHOOL AL WADI AL KABIR

PRACTICE EXAM (2021-2022)-Term -I

Class: XII   Sub: APPLIED MATHEMATICS (241)   Max Marks: 40

Date: 14.11.2021   Time: 90 minutes

General Instructions:
1. This question paper contains two parts A, B and C. Each part is compulsory.
2. Section A has 20 questions, attempt any 16 out of 20.
3. Section B has 20 questions, attempt any 16 out of 20.
4. Section C has 10 questions, attempt any 8 out of 10.
5. *There is no internal choice in any question and no negative marking.*
6. All questions carry equal marks.

Section A

In this section, attempt any 16 questions out of Questions 1 – 20. Each Question is of 1-mark weightage

Q1.	A man can row at 10 km/hr in still water. If the river is running at 2 km/hr, it takes him 75 minutes to row to a place and back. How far is the place						
	A	4.5km	**B**	5km	**C**	6km	**D**	8km
Q2.	A can run 22.5 meter while B runs 25 meter in the same time. In a 1000 m race, by how much distance B beats A?						
	A	200m	**B**	120m	**C**	40m	**D**	100m
Q3.	A pipe can fill a tank in 40 minutes. Due to a leakage in the bottom it took 60 minutes to fill the tank. How much time will it take for the leakage to empty the full tank?						
	A	30minutes	B	1 *hr*	C	2 *hrs*	D	4*hrs*
Q4.	The last two digits of the product $2103 \times 3125 \times 45123$						
	A	23	**B**	25	**C**	75	**D**	45

Q5.	If the matrix $\begin{pmatrix} 0 & x & 3 \\ 2 & y & -1 \\ z & 1 & 0 \end{pmatrix}$ is a skew symmetric matrix, then values of x, y and z:						
	A	$x = 0, y = 1, z = 0$	B	x=2, y=0, z= 3	C	x= -2, y=1, z= -3	D	x= -2, y= 0, z= -3

Q6.	If A = $\begin{pmatrix} 5 & 3 & -2 \\ 0 & 5 & 1 \\ 2 & 2 & -2 \end{pmatrix}$, then cofactor of *the element* 1.						
	A	0	B	4	C	-4	D	-6

Q7.	If $\begin{bmatrix} 5 & -10 & 3 \\ -2 & -4 & 6 \\ -1 & -2 & b \end{bmatrix}$ is a singular matrix then value of b						
	A	3	B	-3	C	2	D	-2

Q8.	If the total revenue Rupees received from sales of x units of a products is given by $R(x) = 3x^2 + 36x + 5$, then the marginal revenue when $x = 15$.						
	A	₹ 126	B	₹ 116	C	₹ 1220	D	₹ 675

Q9.	$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = $ _____						
	A	0	B	$(a-b)(b-c)(c-a)$	C	$a^2b^2c^2$	D	$abc(a^2 + b^2 + c^2)$

Q10.	If $f(x) = x^3 - 3x$, then $f(x)$ is strictly decreasing in						
	A	$(1, \infty)$	B	$(-\infty, -1))$	C	$(-1, 1)$	D	$(0, 1)$

Q11.	The maximum profit that a company can make, if the profit function is given by $P(x) = 41 + 24x - 18x^2$.						
	A	41	B	43	C	65	D	49

Q12.	The mean of a distribution is 60 with standard deviation 5. Assuming that the distribution is normal, what percentage of items be between 65 and 75? Given: $P(Z < 1) = 0.8413,$ $P(Z < 2) = 0.9772,$ $P(Z < 3) = 0.9986$						
	A	19.73	**B**	15.73	**C**	20.74	**D** 12.14

Q13.	Ten Oranges are drawn successively with replacement from a lot containing 10% defective oranges. Find the probability that there is at least one defective orange.						
	A	$1 - \dfrac{9^{11}}{10^{11}}$	**B**	$1 - \dfrac{9^{10}}{10^{10}}$	**C**	$1 - \dfrac{9^{10}}{10^{10}}$	**D** $1 - \dfrac{9^9}{10^9}$

Q14.	If the proportion of defective in a bulk is 4% then the probability of 2 defective in a sample of 10. (Given: $e^{-0.4} = 0.6703$)						
	A	0.0536	**B**	0.0636	**C**	0.0736	**D** 0.0836

Q15.	Find the mean number of heads in three tosses of a fair coin						
	A	1	**B**	1.5		2	**D** $\dfrac{1}{2}$

Q16.	If the mean and variance of a binomial distribution are $\frac{4}{3}$ and $\frac{8}{9}$ respectively, then P(x=1)						
	A	$\dfrac{32}{27}$	**B**	$\dfrac{8}{27}$	**C**	$\dfrac{32}{81}$	**D** $\dfrac{8}{81}$

Q17.	The variance of a Poisson distribution is 2, then P(X=2)						
	A	$\dfrac{2}{e^2}$	**B**	$\dfrac{4}{e^2}$	**C**	$2e^2$	**D** $4e^2$

Q18.	Which index number is called as ideal index number?						
	A	Laspeyres' index	**B**	Paasche index	**C**	Fisher's index	**D** Marshall-Edgeworth's index

Q19.	Given that $\Sigma\, p_0 q_0 = 6600$, $\Sigma\, p_0 q_1 = 8255$, $\Sigma\, p_1 q_0 = 9550$, $\Sigma\, p_1 q_1 = 12010$, where subscripts 0 and 1 are used for base year and current year respectively. The Paashe's index number is:						
	A	144.70	**B**	145.49	**C**	143.09	**D** 125.76

Q20.	The weighted aggregate index number for the following data is:							

Variable	Price		Weights
	Base year	Current year	
A	4	5	60
B	2	3	50
C	1	2	30

A	72.5	**B**	142.8	**C**	137.83	**D**	140.5

SECTION – B

In this section, attempt any 16 questions out of the Questions 21 - 40. Each Question is of 1-mark weightage.

Q21.	What time will it be after 200 hours, if the present time is 5:00 am?

A	5:00 am	**B**	5:00 pm	**C**	1:00pm	**D**	1:00am

Q22.	Evaluate: $7^{12}(mod5)$

A	0	**B**	1	**C**	2	**D**	5

Q23.	The probability of an event A occurring is 0.4 and of B is 0.5. If A and B are mutually exclusive events, then P(A/B).

A	0.4	**B**	0	**C**	0.8	**D**	0.9

Q24.	During a pandemic, 10% of the patients who have the disease get complications. If 100 patients of a locality get infected by the disease, then the standard deviation of the number of patients getting complications is:

A	1	**B**	2	**C**	3	**D**	4

Q25.	Suppose that two cards are drawn at random from a deck of cards. Let X be the number of aces obtained. Then the value of E(X) is						
	A	$\dfrac{2}{13}$	B	$\dfrac{5}{13}$	C	$\dfrac{1}{13}$	D	$\dfrac{37}{221}$

Q26.	The total area under the normal distributed curve above the base line i.e. $\int_{-\infty}^{\infty} f(x)dx =$?						
	A	0	B	∞	C	0.5	D	1

Q27.	How many times must we should toss a fair coin so that the probability of getting at least one head is more than 90%?						
	A	2	B	3	C	4	D	5

Q28.	A, B and C enter into a partnership. B contributes one third of the capital while A contributes as much as B and C together contribute. The ratio of their capital is						
	A	1:2:3	B	2:3:1	C	3:2:1	D	3:1:2

Q29.	Akshay started a business by investing ₹ 40000 After 4 months Ashwin joined his business and invested ₹ 50000 The share of Ashwin in the profit if they earn ₹ 220000 as profit in the entire year						
	A	₹ 100000	B	₹ 110000	C	₹ 120000	D	₹ 90000

Q30.	The random variable X has a probability distribution P(X) of the following form, where k is some number: $$P(X = x_i) = \begin{cases} 0.1, & if\ x = 0 \\ kx, & if\ x = 1\ or\ 2 \\ k(5-x), & if\ x = 3\ or\ 4 \end{cases}$$ Determine the value of k						
	A	$\dfrac{3}{20}$	B	$\dfrac{3}{10}$	C	$\dfrac{2}{5}$	D	$\dfrac{11}{20}$

Q31.	The length of a rectangle is twice the breadth. If the perimeter of the rectangle is at least 120 cm, then						
	A $breadth < 20cm$	**B**	$breadth \leq 20cm$	**C** $breadth > 20cm$	**D**	$breadth \geq 20cm$	

Q32.	$[1 \quad x \quad 1]\begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix}\begin{bmatrix} x \\ 1 \\ -2 \end{bmatrix} = \mathbf{0}$ Then x= __						
	A $\dfrac{1}{2}$	**B**	$-\dfrac{1}{2}$	**C** 2	**D**	-2	

Q33.	The points at which the tangent to the curve $y = x^3 + 5$ is perpendicular to the line $x + 3y = 2$ are						
	A (1, 6) and (-1, 4)	**B**	(1,6) and (1, 4)	**C** (6, 1) and (4, 1)	**D**	(6,1) and (-1, 4)	

Q34.	The second order derivative of $x.(logx)$ with respect to x.						
	A $\dfrac{x}{1+x}$	**B**	$\dfrac{1+x}{x}$	**C** $\dfrac{logx}{x}$	**D**	$1 + logx$	

Q35.	The demand function of a toy is $p(x) = 25 - \dfrac{x}{3}$ and its total cost function is $c(x) = 100 + 3x$. For maximum profit, the value of x is						
	A 22	**B**	25	**C** 100	**D**	33	

Q36.	During a certain period, the cost of living index number goes from 125 to 150 and the salary of a worker is also raised from ₹ 20000 to ₹ 23700. Then which of the following is true?						
	A Worker actually loses ₹ 200	**B**	Worker actually gains ₹ 200	**C** Worker actually loses ₹ 700	**D**	Worker actually gains ₹ 700	

Q37.	The wholesale price index of rice in 2020 compared to 2015 is 140. If the cost of rice was ₹ 25 per kg in 2015, calculate the cost in 2020.						
	A	₹ 28	**B**	₹ 35	**C**	₹ 40	**D**	₹ 30

Q38.	If Laspeyre's index number = 160, Paasche's index number = 90 then Fisher's index number is						
	A	90	**B**	120	**C**	140	**D**	160

Q39.	Price index by Marshall Edgeworth method takes						
	A	q_0 as weights	**B**	q_1 as weights	**C**	$q_0 . q_1$ as weights	**D**	$\dfrac{q_0 + q_1}{2}$ as weights

Q40.	If A is a square matrix of order 3 and $|A| = -5$, then $|A. adjA| = $ _____						
	A	-5	**B**	25	**C**	-125	**D**	625

SECTION – C

In this section, attempt any 8 questions out 10 Questions. Each question is of 1-mark weightage.

(Questions 46-50 are based on a Case-Study).

Q41.	The CP of type 1 rice is ₹ 60 per Kg and that of type2 is ₹ 80 per Kg If both are mixed in the ratio 2:3 then the price per Kg of the mixed rice is ₹------------						
	A	72	**B**	75	**C**	65	**D**	70

Q42.	If $0 < x < 1$, which of the following is the greatest?						
	A	x	**B**	x^2	**C**	$\dfrac{1}{x}$	**D**	$\dfrac{1}{x^2}$

Q43.	$If\ x^2 + y^2 = 25, then\ \dfrac{dy}{dx}$							
	A	$\dfrac{25 - 2x}{2y}$	**B**	$-\dfrac{x}{y}$	**C**	$-\dfrac{x}{2y}$	**D**	$-\dfrac{2y}{x}$

Q44.	Given: A and B throw a die alternatively till one of them gets a '6' and wins the game. If A starts the game, then the probability of A wins the game is ---------------							
	A	1	**B**	0	**C**	$\dfrac{6}{11}$	**D**	$\dfrac{5}{11}$

Q45. Atul scored 800 marks in total out of 1000. The average score for the batch was 710 and the standard deviation was calculated to be 180. Find out how has Atul scored compared to his batch mates in the whole district.

Given: Z-table (values from 0.1 to 1.0)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621

A	Atul did better than 69.15% of students in the district.	**B**	Atul did better than 30.85% of students in the district.
C	Ramesh did better than 84.13% of students in the district.	**D**	Atul did better than 15.87% of students in the district.

CASE STUDY BASED QUESTION

An industry produces only two goods x and y. The two commodities serve as intermediate input in each other's productions. 0.1 unit of x and 0.55 unit of y are needed to produce a unit of x. Whereas 0.4 unit of X and 0.2 unit of y are needed to produce a unit of Y. For final consumption 240 units of X and 140 units of Y are needed.

Based on the above information answer the following questions:

Q46.	The technology matrix A is

A	$\begin{pmatrix} 0.1 & 0.4 \\ 0.55 & 0.2 \end{pmatrix}$	B	$\begin{pmatrix} 0.1 & 0.2 \\ 0.55 & 0.4 \end{pmatrix}$	C	$\begin{pmatrix} 0.2 & 0.4 \\ 0.55 & 0.1 \end{pmatrix}$	D	$\begin{pmatrix} 0.1 & 0.55 \\ 0.4 & 0.2 \end{pmatrix}$

Q47.	The demand Matrix D is

A	$\begin{pmatrix} 140 \\ 240 \end{pmatrix}$	B	$\begin{pmatrix} 240 \\ 140 \end{pmatrix}$	C	$\begin{pmatrix} 100 \\ 140 \end{pmatrix}$	D	$\begin{pmatrix} 240 \\ 100 \end{pmatrix}$

Q48.	If I represents the identity matrix of order 2, then $I - A$

A	$\begin{pmatrix} 0.9 & 0.8 \\ 0.45 & 0.6 \end{pmatrix}$	B	$\begin{pmatrix} 0.8 & -0.4 \\ -0.55 & 0.9 \end{pmatrix}$	C	$\begin{pmatrix} 0.9 & -0.4 \\ -0.55 & 0.8 \end{pmatrix}$	D	$\begin{pmatrix} 0.9 & -0.55 \\ -0.4 & 0.8 \end{pmatrix}$

Q49.	$(I - A)^{-1} =$

A	$2\begin{pmatrix} 0.8 & 0.4 \\ 0.55 & 0.9 \end{pmatrix}$	B	$2\begin{pmatrix} 0.9 & 0.4 \\ 0.55 & 0.8 \end{pmatrix}$	C	$\frac{1}{2}\begin{pmatrix} 0.8 & -0.4 \\ -0.55 & 0.9 \end{pmatrix}$	D	$\frac{1}{2}\begin{pmatrix} 0.9 & 0.55 \\ 0.4 & 0.8 \end{pmatrix}$

Q50.	The gross output of two commodities are

A	$X = 596,$ $Y = 416$	B	$X = 470,$ $Y = 510$	C	$X = 496,$ $Y = 416$	D	$X = 496, Y = 516$

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