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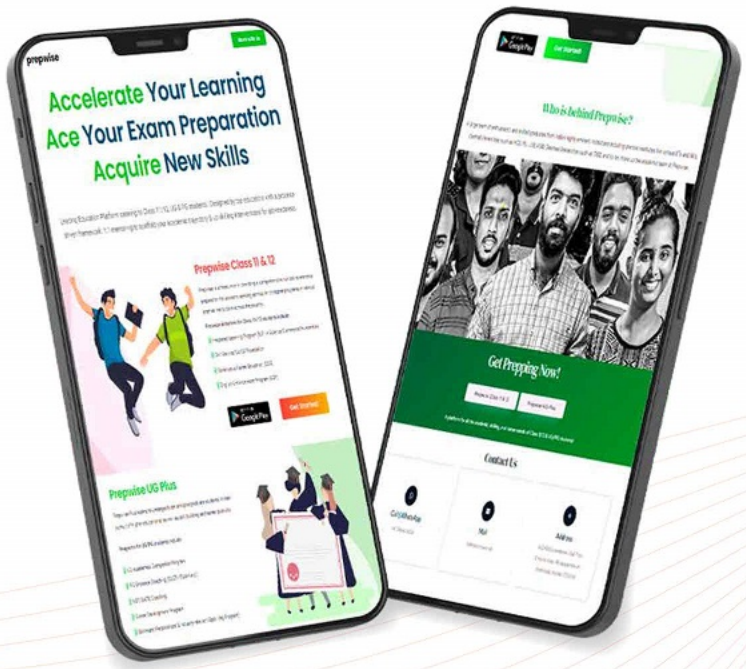

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Previous Year Question Paper

2022

Section II
Mathematics

Section Name:COMPULSORY

Question:

Let A and B be two non zero square matrics and AB and BA both are defined. It means

A	No. of columns of A ≠ No. of rows of B
B	No. of rows of A ≠ No. of columns of B
C	Both matrices (A) and (B) have same order
D	Both matrices (A) and (B) does not have same order

Section Name:COMPULSORY

Question:

If $A = \begin{bmatrix} 2 & -3 \\ 3 & 5 \end{bmatrix}$, then which of the following statements are correct?

A. A is a square matrix
B. A^{-1} exists
C. A is a symmetric matrix
D. $|A| = 19$
E. A is a null matrix

Choose the correct answer from the options given below.

A	A, B, C only
B	A, D, E only
C	A, B, D only
D	C, D, E only

Section Name:COMPULSORY

Question:

The number of all possible matrices of order 2×2 with each entry 0 or 1 is:

A	27
B	18
C	16
D	81

Section Name:COMPULSORY

Question:

If $y=\left(\frac{1}{x}\right)^x$, then value of $e^e\left(\frac{d^2y}{dx^2}\right)_{x=e}$ is:

A	$2-\frac{1}{e}$
B	$4-\frac{1}{e}$
C	$\frac{1}{e}$
D	$1-\frac{1}{e}$

Section Name:COMPULSORY

Question:

The function $f(x) = x^2 - 2x$ is strictly decreasing in the interval

A	$(-\infty, -1)$
B	$(-1, \infty)$
C	$(-\infty, 1)$
D	$(-1, \infty)$

Section Name:COMPULSORY

Question:

$\int \frac{dx}{x(x^5+3)}$ is equal to

A	$\frac{1}{3}\log\left\lvert\frac{x^5}{x^5+3}\right\rvert+C$
B	$\frac{1}{15}\log\left\lvert\frac{x^5}{x^5+3}\right\rvert+C$
C	$\frac{1}{5}\log\left\lvert\frac{x^5}{x^5+3}\right\rvert+C$
D	$\frac{1}{25}\log\left\lvert\frac{x^5}{x^5+3}\right\rvert+C$

Section Name:COMPULSORY

Question:

If $\int \frac{x^3}{x+1} dx = q(x) - \log|x+1| + C$ then q(x) is equal to :

A	$q(x) = \frac{x^3}{3} + x$
B	$q(x) = \frac{x^2}{2} - x$
C	$q(x) = x^2 - x + 1$
D	$q(x) = \frac{x^3}{3} - \frac{x^2}{2} + x$

Section Name:COMPULSORY

Question:

$$\int_{-1}^{1}\left(|x-2|+|x|\right)dx =$$

A	7
B	5
C	4
D	6

Section Name:COMPULSORY

Question:

If a and b are order and degree of differential equation $y''+(y')^2+2y=0$, then value of $2a + 6b$, is :

A	3
B	4
C	6
D	10

Section Name:COMPULSORY

Question:

The solution of the differential equation $xdy - ydx = 0$ represent family of

A	Circles passing through origin.
B	Straight line parsing through $(-1, 6)$.
C	Straight line passing through the origin.
D	Circle whose center is at the origin.

Section Name:COMPULSORY

Question:

For differential equation $y e^{\frac{x}{y}}\, dx = \left(x e^{\frac{x}{y}} + y^2 \right) dy,\ y(0) = 1$, the value of $x\,(e)$ is equal to :

A	0
B	1
C	2
D	e

Section Name:COMPULSORY

Question:

$$\int_{-1}^{1} e^{|x|}\,dx =$$

A	$2(e^{-1}-1)$
B	$2(e+1)$
C	$e-1$
D	$2(e-1)$

Section Name:COMPULSORY

Question:

For two events A, B

$P(A \cup B) = \frac{7}{12}$, $P(A) = \frac{5}{12}$, $P(B) = \frac{3}{12}$ Then $P(A \cap B) =$

A	$\frac{1}{2}$
B	$\frac{1}{12}$
C	$\frac{1}{6}$
D	$\frac{1}{3}$

Question:

The probability distribution of X is :

x	0	1	2	3	4
$P(X = x)$	0.1	2k	k	k	2k

Then var(X) =

A $\frac{3}{20}$

B $\frac{9}{4}$

C $\frac{141}{20}$

D $\frac{159}{80}$

Section Name:COMPULSORY

Question:

The maximum value of $z = 4x + 2y$ subject to constraints

$2x + 3y \leq 28,$

$x + y \leq 10,$

$x, y \geq 0$ is :

A	36
B	40
C	$\frac{100}{3}$
D	32

Section Name: MATHEMATICS APPLIED

Question:

The number at unit place of number 17^{123} is :

A	1
B	3
C	7
D	9

Section Name:MATHEMATICS APPLIED

Question:

Match List I with List II

LIST I		LIST II	
A.	$3^3 \equiv b(\text{mod}\,9)$	I.	4
B.	$2^5 \equiv b(\text{mod}15)$	II.	0
C.	$4^3 \equiv b(\text{mod}10)$	III.	2
D.	$5^3 \equiv b(\text{mod}12)$	IV.	5

Choose the correct answer from the options given below:

A	A - IV, B - III, C - II, D - I
B	A - II, B - III, C - I, D - IV
C	A - I, B - II, C - III, D - IV
D	A - III, B - I, C - IV, D - II

Section Name:MATHEMATICS APPLIED

Question:

A mixture contains milk and water in the ratio $8 : x$. If 3 liters of water is added in 33 liters of mixture, the ratio of milk and water becomes $2 : 1$, then value of x is :

A	3 Litres
B	4 Litres
C	2 Litres
D	11 Litres

Section Name:MATHEMATICS APPLIED

Question:

A motorboat can travel in still water at the speed 15km/h, while the speed of the current is 3km/h. Time taken by boat to go 36km upstream is:

A	2 hr
B	3 hr
C	12 hr
D	18 hr

Section Name:MATHEMATICS APPLIED

Question:

Hari covers 100m distance in 36 seconds. Ram covers the same distance in 45 seconds. In a 100m race, Hari ahead from Ram is

A	20m
B	30m
C	25m
D	40m

Section Name:MATHEMATICS APPLIED

Question:

A pipe can empty $\left(\frac{5}{6}\right)^{th}$ part of a cistern in 20 minutes. The part of cistern which will be empty in 9 minutes is:

A	$\frac{3}{5}$
B	$\frac{3}{8}$
C	$\frac{4}{5}$
D	$\frac{5}{9}$

Question:

The system of linear inequalities $2x - 1 \geq 3$ and $x - 3 > 5$ has solution:

A	$(2, \infty)$
B	$(2, 8)$
C	$(8, \infty)$
D	$(-\infty, 8)$

Section Name:MATHEMATICS APPLIED

Question:

The values of x which statisfied $|3x| \geq |6-3x|$

A. $(0, 1]$
B. $[1, 4]$
C. $(4, \infty)$
D. $(-1, 0)$
E. $(-\infty, 0)$

Choose the correct answer from the options given below:

A	A and B only
B	C and E only
C	B and C only
D	D and E only

Section Name:MATHEMATICS APPLIED

Question:

If $\begin{bmatrix} x & y & z \\ 2 & u & v \\ -1 & 6 & w \end{bmatrix}$ is skew symmetric matrix, then value of $x^2 + y^2 + z^2 + u^2 + v^2 + w^2$ is :

A	1
B	4
C	36
D	41

Section Name:MATHEMATICS APPLIED

Question:

If $y = e^{nx}$, then n^{th} derivative of y is :

A	e^{nx}
B	n^2e^{nx}
C	ny
D	n^ny

Section Name:MATHEMATICS APPLIED

Question:

The total revenue (in Rs.) received by selling 'x' units of a certain products is given by: $R(x) = 4x^2 + 10x + 3$.

What is the marginal revenue on selling 20 such units?

A	Rs. 130
B	Rs. 170
C	Rs. 173
D	Rs. 360

Section Name:MATHEMATICS APPLIED

Question:

If x is a real, then minimum value of $x^2 - 8x + 17$ is :

A	-1
B	0
C	1
D	2

Section Name:MATHEMATICS APPLIED

Question:

If μ is mean of random variable X, with probability distribution distribution

x	0	1	2
P(X=x)	$\frac{4}{9}$	$\frac{4}{9}$	$\frac{1}{9}$

then value of $9\mu+4$ is:

A	4
B	9
C	10
D	17

Section Name:MATHEMATICS APPLIED

Question:

In a game, a child will win Rs 5 if he gets all heads or all tails when three coins are tossed simultaneously and he will lose Rs 3 for all other cases. The expected amount to lose in the game is

A	Rs. 0
B	Rs. 0.8
C	Rs. 1
D	Rs. 2

Section Name:MATHEMATICS APPLIED

Question:

The Probability mass functions of Random variable X is :

$P(X = x) = (0.6)^x (0.4)^{1-x}; x = 0, 1$ The variance of X is :

A	0.60
B	0.124
C	0.244
D	0.240

Section Name:MATHEMATICS APPLIED

Question:

Match List I with List II

LIST I		LIST II	
A.	Quantity index	I.	Measures relative price change over a period of time.
B.	Time series	II.	Measures change in quantity of consumption of goods over a specific period of time.
C.	Price index	III.	Measures average value of goods for specific time period.
D.	Value index	IV.	Statistical observation taken at different points of time for specific period of time.

Choose the correct answer from the options given below:

A	A - III, B - I, C - II, D - IV
B	A - II, B - III, C - I, D - IV
C	A - III, B - IV, C - I, D - II
D	A - II, B - IV, C - I, D - III

Section Name:MATHEMATICS APPLIED

Question:

Given that $\sum p_0q_0 = 700$, $\sum p_0q_1 = 1450$, $\sum p_1q_0 = 855$ and $\sum p_1q_1 = 1300$.

Where subscripts 0 and 1 are used for base year and current year respectively. The Laspeyer's price index number is :

A	118.46
B	119.35
C	120.23
D	122.14

Section Name:MATHEMATICS APPLIED

Question:

If $y = a + b\,(x - 2005)$ fits the time series date

x (year) :	2003	2004	2005	2006	2007
y (yield in tons) :	6	13	17	20	24

Then the value of $a + b$ is:

A	16
B	20.3
C	43
D	80.3

Section Name:MATHEMATICS APPLIED

Question:

Which of the following statements are correct?

A. If discount rate > coupon rate, then present value of a bond > face value
B. An annuity in which the periodic payment begins on a fixed date and continues forever is called perpetuity
C. The issuer of bond pays interest at fixed interval at fixed rate of interest to investor is called coupon payment
D. A sinking fund is a fixed payment made by a borrower to a lender at a specific date every month to clear off the loan
E. The issues of bond repays the principle i.e. face value of the bond to the investor at a later date termed as maturity date

Choose the correct answer from the options given below:

A	A, C, E only
B	A, B, D only
C	B, C, E only
D	A, B, C only

Section Name:MATHEMATICS APPLIED

Question:
Which of the following statements is true?

A. EMI in flat rate method, $\text{EMI} = \frac{\text{Principle} + \text{Interest}}{\text{Number of Payment}}$

B. EMI in reducing balance method, $\text{EMI} = P \times \frac{i}{1+(1+i)^n}$ where P= Principle, i= interest rate, n= no. of payments

C. In sinking fund, a fixed amount at regular intervals is deposited.

D. Approximate Yield to Maturity $= \frac{\text{Coupen Payment} + \frac{\text{Face Value} + \text{Present Value}}{\text{Number of Payment}}}{\frac{\text{Face Value} + \text{Present Value}}{2}}$

Choose the correct answer from the options given below:

A	A and B only
B	B and C only
C	A and C only
D	C and D only

Section Name:MATHEMATICS APPLIED

Question:

Mr. Dev wishes to purchase an AC for Rs. 45,000 with a down payment of Rs. 5000 and balance in EMI for 5 years. If Bank charges 6% per annum compounded monthly then monthly EMI is: (use $\frac{0.005}{1-(1.005)^{-60}} = 0.0194$)

A	Rs. 776
B	Rs. 700
C	Rs. 737
D	Rs. 673

Question:

The cost of a machine is Rs 20,000 and its estimated useful life is 10 years. The scrap value of the machine, when its value depriciates at 10% p.a, is :

use $(0.9)^{10} = 0.35$

A	Rs. 9672
B	Rs. 7000
C	Rs. 6982
D	Rs. 3500

Section Name:MATHEMATICS APPLIED

Question:

One of the following is true for relation between sample mean $(\bar{x})$ and population mean (μ) .

A	$\lvert \bar{x} - \mu \rvert$ increases when increases the size of samples
B	$\bar{x} = \mu$, for all sample sizes
C	$\lvert \bar{x} - \mu \rvert$ do not change with size of samples
D	$\lvert \bar{x} - \mu \rvert$ decreases when increase the size of samples

Section Name:MATHEMATICS APPLIED

Question:

Below are the stages for Drawing statistical inferences.

A. Sample
B. Population
C. Making Inference
D. Data tabulation
E. Data Analysis

Choose the correct answer from the options given below :

A	B, D, A, E, C
B	A, B, D, C, E
C	B, A, D, E, C
D	D, B, A, C, E

Section Name:MATHEMATICS APPLIED

Question:

Corner points of the feasible region for an LPP, are (0, 2), (3, 0), (6, 0) and (6, 8). If $z = 2x + 3y$ is the objective function of LPP then max.(z) – min.(z) is equal to :

A	30
B	24
C	21
D	9

Passage:

Sitaram, a money lender lent a part of Rs 200000 to Shyam at simple interest 6% p.a. and the remaining to Sushil at 10% p.a. at simple interest. Sitaram earned an annual interest income of Rs. 18000. Based on the given information answer the following questions :

Section Name:MATHEMATICS APPLIED

Question:

What is the mean rate of interest?

A	6% p.a.
B	8% p.a.
C	9% p.a.
D	16% p.a.

Section Name:MATHEMATICS APPLIED

Question:

In what ratio did Sitaram lent the money at 6% p.a. and 10% p.a. respectively?

A	1 : 3
B	3 : 1
C	2 : 3
D	3 : 5

Section Name:MATHEMATICS APPLIED

Question:

How much money did Shyam borrow?

A	Rs 150000
B	Rs 75000
C	Rs 50000
D	Rs 12000

Section Name:MATHEMATICS APPLIED

Question:

What amount of money is lent at 10% p.a. simple interest?

A	Rs. 20,000
B	Rs. 50,000
C	Rs. 75,000
D	Rs. 1,50,000

Section Name:MATHEMATICS APPLIED

Question:

What is the ratio of the interest paid by Shyam and Sushil respectively

A	1:3
B	1:5
C	3:5
D	2:3

Passage:

Item are based on the information below:

A cable network provider in a small town has 500 subscribers and he used to collect Rs. 300 per month from each subscriber. He proposes to increase the monthly charges and it is believed from the past experience that for every increase of Rs. 1, one subscriber will discontinue the service. Based on the above in formation, answer the following question :

Section Name:MATHEMATICS APPLIED

Question:

If Rs x is the monthly increase in subscription amount, then the number of subscribers are

A	x
B	$500 - x$
C	$x - 500$
D	500

Section Name:MATHEMATICS APPLIED

Question:

Total revenue 'R' is given by (in Rs.)

A	$R = 300x + 300\,(500 - x)$
B	$R = (300 + x)\,(500 + x)$
C	$R = (300 + x)\,(500 - x)$
D	$R = 300x + 500\,(x + 1)$

Section Name:MATHEMATICS APPLIED

Question:

The number of subscribers which gives the maximum revenue is

A	100
B	200
C	300
D	400

Section Name:MATHEMATICS APPLIED

Question:

What is increase in changes per subscriber that yields maximum revenue?

A	100
B	200
C	300
D	400

Section Name:MATHEMATICS APPLIED

Question:

The maximum revenue generated is

A	Rs. 200000
B	Rs. 180000
C	Rs. 160000
D	Rs. 150000