LIONS SCHOOL, MIRZAPUR

Pre-Board One Examination 2020-21

Class-XII Time : 3 hrs

Subject: Mathematics MM: 80

General Instructions:

1. This question paper contains two parts A & B. each part is compulsory. Part A carries 24 marks and part B carries 56 marks.
2. Part A-has Objective Type questions and part-B has descriptive type questions.
3. Both parts A and part B have choices.

Part-A:

1. It consists of two sections I and II.
2. Section-I comprises of 16 very short answer type questions.
3. Section- II contains two case studies. Each case study comprises of 5 case – based MCQs. An examinee is to attempt any four out of 5 questions.

Part-B:

1. It consists of three sections – III, IV and V.
2. Section III comprises 10 questions of 2 marks each.
3. Section IV comprises 7 questions of 3 marks each.
4. Section V comprises 3 questions of 5 marks each.
5. Internal choice is provided in 3 questions of section-III,2 questions of Section-IV and 3 questions of Sections-V. You have to attempt only one of the alternatives in all such questions.

Part – A

All questions are compulsory. In case of internal choices attempt anyone.

Q1. State whether the function f(x) = 5x is surjective or not.

OR

If R = {(x,y): x + 2y = 8} is a relation on N, write the range of R.

Q2. Let R be the equivalence relation in the set A = { 0,1,2,3,4,5} given by R = {(a,b):2 divides (a-b) }. Write the equivalence class [0].

Q3. State the reason for the relation R in the set given by R = {(1,2),(2,1)} not to be transitive .

OR

Find the domain of function f(x) = $(sin^{-1}$x)/x.

Q4. Write the element of a_{23} of a 3x3 matrix A = [a_{ij}] whose elements are given by $a_{ij} = \frac{|i-j|}{2}$.

Q5. If $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$, write the value of a-2b.

OR

Solve the following matrix equation for x: $[x \quad 1] \begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O$

Q6. Let A = $[a_{ij}]$ be a square matrix of order 3x3 and |A|= -5. Then find the value of |adjA|.

Q7. Evaluate $\int \frac{dx}{sin^2x\,cos^2x}$.

OR

Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x^3 sin^2 x$ dx.

Q8. Write sum of the order and degree of the following differential Equation $\frac{d}{dx}\{(\frac{dy}{dx})^3\}$ = 0.

OR

Write the solution of the differential equation $\frac{dy}{dx}$ = 2^{-y}

Q9. Evaluate $\int_0^2 \sqrt{4-x^2}$ dx.

Q10. Find the value of 'p' for which the vectors $3\hat{\imath} + 2\,\hat{\jmath} + 9\,\hat{k}$ and $\hat{\imath} - 2p\,\hat{\jmath} + 3\,\hat{k}$ are parallel.

Q11. If $\vec{a}$ and $\vec{b}$ two vectors such that $|\vec{a}.\vec{b}| = |\vec{a} \times \vec{b}|$, then find the angle between $\vec{a}$ and $\vec{b}$.

Q12. Find the projection of $\vec{b} + \vec{c}$ on $\vec{a}$ where $\vec{a} = \hat{\imath} + 2\,\hat{\jmath} + \hat{k}$, $\vec{b} = \hat{\imath} + 3\hat{\jmath} + \hat{k}$ and $\vec{c} = \hat{\imath} + \hat{k}$.

Q13. The equation of a line is 5x-3 = 15y+7 = 3-10z. write the direction cosine of the line.

Q14. Find the length of perpendicular drawn from origin to the plane 2x-3y +6z+21=0.

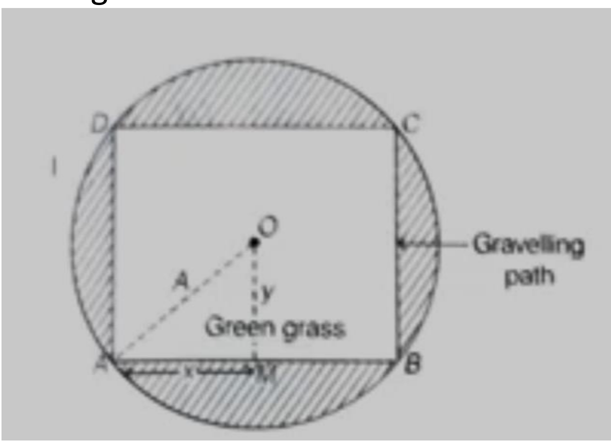
Q15. Let E_1 and E_2 are the two independent events such that $P(E_1)=0.35$ and $P(E_1 \cap E2)=0.60$, find $P(E_2)$.

Q16. A coin is tossed thrice. Let the event E be 'the first throw result in a head', and the event F be 'the last through result in a tail'. Find whether the event E and F are independent.

Section II

Both the case study-based questions are compulsory. Attempt any 4 sub pars from each question (17-21) and (22-26). Each question carries one mark.

Q17. An architect designs a garden in society the garden is in the shape rectangle inscribed in a circle of radius 10 meter as shown in given figure .



Based on the above information answer the following.

i) 2x and 2y represents the length and breadth of the rectangular part, then the relation between the variables is

a). $x^2 - y^2 = 10.$

b). $x^2 + y^2 = 10.$

c). $x^2 - y^2 = 100.$

d). $x^2 + y^2 = 100.$

ii) The area of the green grass A expressed as a function x is

a). $2x\sqrt{100 - x^2}$

b). $4x\sqrt{100 - x^2}$

c). $2x\sqrt{100 + x^2}$

d). none of these.

iii) The maximum value of area A is

a). 100 m^2

b). 200 m^2

c). 400 m^2

d). none of these.

iv) The value of length of rectangle, if A is maximum, is

a). $10\sqrt{2}$ m

b). $20\sqrt{2}$ m

c). 20 m

d). $5\sqrt{2}$ m

v). The area of gravelling path is

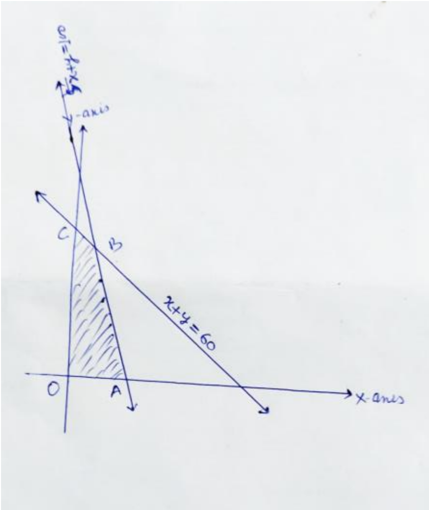
a). $100(\pi + 2)$ m^2

b). $100(\pi - 2)$ m^2

c). $200(\pi + 2)$ m^2

d). $200(\pi - 2)$ m^2

Q18. A furniture dealer deals in only two items: table and chairs. He has Rs5ooo to invest and a space to store at most 60 pieces. A table cost him Rs250 and a chair Rs50. He can sell a table at a profit of Rs50 and a chair Rs15. Assuming that he can sell all the items that he buys.



Let x and y be the required numbers of tables and chairs then by formulating LPP, answer the following problems with the help of above figure.

I) Profit function P is given by

a). P = 15x + 50y

b). P = 50x + 15y

c). P = 250x + 500y

d). None of these

II) Coordinate of point B is

a). (10,50)

b). (50,10)

c). (60,0)

d). None of these

III) Maximum value of P is

a). 1000

b). 1200

c). 1250

d). None of these

IV) For a maximum profit, the dealer should purchase

a). 10 chairs and 50 tables.

b). 50 chairs and 10 tables

c). 10 chairs and 10 tables

d). None of these

V) Inequation $x + y \leq 60$ shows solution region

a). contains origin.

b). does not contain origin.

c). cannot predict result by above information.

d). origin has no role in the solution of the given inequation.

Part -B

Section- iii

Q.Nos. 19 to 28 carry 2 marks each.

Q19. Solve for x $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$.

Q20. If matrix A = $\begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ and $A^2 = pA$, then write the value of p.

OR

If the determinant of matrix A of order 3x3 is of value 4, write the value of |3A|.

Q21. Find the value of constant k show that function f, defined below, is continuous at x=0, where

$$F(x) = \begin{cases} \frac{(1-\cos 4x)}{8x^2} & ; \ if\ x \neq 0 \\ k & ; \quad if\ x = 0 \end{cases}$$

Q22. Find the angle of intersection of the curves $y^2 = 4ax$ and $x^2 = 4by$.

Q23. Show that $\int_{-2}^{2} |x+1| dx = 6$.

OR

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

Q24. Find the area bounded by the curve $y^2 = 4x$, the x- axis and lines x=1, x=4.

Q25. Find the general solution of differential equation $\log\left(\frac{dy}{dx}\right) = (ax+by)$.

Q26. Find the area of the rhombus whose diagonals are $(\hat{\imath} + 2\hat{\jmath} + 3\hat{k})$ and $(3\hat{\imath} - \hat{\jmath} + 4\hat{k})$ respectively.

Q27. Find the cartesian equation of the plane $\vec{r} = (s - 2t)\hat{\imath} + (3 - t)\hat{\jmath} + (2s + t)\hat{k}$.

Q28. A die is thrown twice and the sum of the number appearing observed to be 8. What is the conditional conditional probability that the number 5 has appeared at least once?

OR

Let A and B be the events such that $2P(A) = P(B) = \frac{5}{13}$ and $P(A/B) = \frac{2}{5}$. Find $P(A \cap B)$.

Section IV

Question nos.29 to 35 carry 3 marks each.

Q29. Let N be the set of all natural numbers and let R be a relation on NxN, defined by (a,b) R(c,d) iff ad = bc. Show that R is an equivalence relation.

Q30. Differentiate ($x^x \sin^{-1}\sqrt{x}$) w.r. to x .

Q31. If x = asin2t(1+cos2t) and y = bcos2t(1-cos 2t) then find $\left(\frac{dy}{dx}\right)_{\text{at } t = \frac{\pi}{4}}$.

OR

Show that f(x) = |x-5| is continuous but not differentiable at x = 5.

Q32. Find the intervals on which the function $f(x) = 10 - 6x - 2x^2$ is

a) Strictly increasing b) Strictly decreasing

Q33. Evaluate $\int \frac{\sqrt{x^2+1}\,\{\log(x^2+1)-2logx\}}{x^4}$dx.

Q34. Evaluate area bounded by the ellipse $\frac{x^2}{4}$ + $\frac{y^2}{9}$ = 1 above the x-axis.

Q35. Find the particular solution of the differential equation

2xy + y^2 - 2$x^2\frac{dy}{dx}$ = 0, it being given that y = 2 when x = 1.

OR

A curve passes through the point (0,2) and the sum of coordinates of any point on the curve exceeds the magnitude of the slope of the tangent to the curve at that point by 5. Find the equation of the curve.

Section V

Question nos.36 to 38 carry 5 marks each.

Q36. Given A = $\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ $and\ B = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$, find AB and use this result in solving the following system of equations:

x – y + z = 4 ; x - 2y - 2z = 9 ; 2x + y + 3z = 1 .

OR

The cost of 4kg potato, 3kg wheat and 2kg rice is Rs60. The cost of 1kg potato, 2kg wheat and 3kg rice is Rs45. The cost of 6kg potato, 2kg wheat and 3kg rice is Rs70. Find the cost of each item per kg by matrix method.

Q37. Find the coordinates of the point where the line through (3, -4, -5) and (2,-3,1) crosses the plane passing through the points (2,2,1),(3,0,1) and (4,-1,0).

OR

Show that the lines $\vec{r}$ = ($\hat{\imath}$ + $\hat{\jmath}$ - $\hat{k}$) + γ(3 $\hat{\imath}$ - $\hat{\jmath}$) and $\vec{r}$ = (4$\hat{\imath}$ - $\hat{k}$) + μ(2 $\hat{\imath}$ +3 $\hat{\jmath}$) intersects. Find their point of intersection.

Q38. Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. Two balls are transferred at random from bag I to bag II and then a ball is drawn from bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball were both black.

OR

There are three coins. One is a two tailed coin (having tail on both faces), another is a biased coin that comes up heads 60% of the times and third is an un biased coin. One of three coin is chosen at random and tossed, and it shows tails. What is the probability that it was a 2- tailed coin?