CLASS XII
SAMPLE PAPER
MATHS-041

Time Allowed: 3 Hours

Maximum marks: 100

General Instructions:

(i) *All questions are compulsory.*

(ii) *The question paper consists of 29 questions divided into three sections A,B and C.Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks each*

(iii) *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.*

(iv) *There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six Marks each. You have to attempt only one of the alternatives in all such questions.*

(v) *Use of calculators is not permitted. You may ask for logarithmic tables, if required.*

SECTION-A

1. If $a * b=a^2+b^2$, evaluate $(1*2)*3$.

2. Find the principal value of $\tan^{-1}(-\sqrt{3})$

3.If A and B are symmetric matrices of the same order.Prove that AB is symmetric if A and B commute.

4.Using determinants,find the area of the triangle whose vertices are (1,4),(2,-3) and (-5,-3).

5.The side of a square is increasing at 4 cm/minute.At what rate is the area increasing when the side is 8 cm long?

6. Let $\vec{a}$ and $\vec{b}$ be two vectors of same magnitude such that the angle between them is 60° and $\vec{a}.\vec{b}=8$.Find $|\vec{a}|$ and $|\vec{b}|$.

7.Find the unit vector perpendicular to both the vectors $\hat{i}-2\hat{j}+3k$ and $\hat{i}+2\hat{j}-k$.

8.Find the direction ratio of the line x+2/1=2y-1/3=3-z/5.

9.Evaluate : $\int 1/\sqrt{1-2x}\, dx$.

10.By using properties of determinants,show that $\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$

SECTION-B

11.Show that the relation R on the set A={x € Z; 0≤x≤12},given by R={(a,b):ıa-bı is a multiple of 4} is an equivalent relation.Find the set of all elements related to 1.

12.If $\cos^{-1}(x/a)+\cos^{-1}(y/b)= \alpha$. Prove that $x^2/a^2-2xy/ab \cos \alpha+y^2/b^2=\sin^2 \alpha$.

13. Using the properties, prove that $\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$

14. Verify Rolle's theorem for the function- $f(x)= x^3-7x^2+16x-12$ in [2,3].

15. If y=xlog(x/a+bx). Prove that $x^3 \times d^2y/dx^2=(xdy/dx - y)^2$.

16. Find the points on the curve $9y^2=x^3$ where normal to the curve makes equal intercepts with the axes.

OR

Find the intervals in which $f(x)=2\log(x-2)-x^2+4x+1$ is increasing or decreasing function.

17. Evaluate $\int (2\sin 2\theta-\cos \theta)/6-\cos^2\theta-4\sin \theta\, d\theta$.

18. Evaluate $\int_0^{\pi} x\, dx/(1+\sin x)$.

OR

Evaluate $\int_0^{\pi/4} \log (1+\tan x)\, dx$.

19.The scalar product of the vector $\hat{i} + \hat{j} +k$ with a unit vector along the sum of vectors $2\hat{i} + 4\hat{j} - 5k$ and $\lambda\hat{i} + 2\hat{j} +3k$ is equal to one .Find the value of λ.

20.Find the vector equation of the line passing through the point (1,2,-4) and perpendicular to the lines x-8/3=y+19/-16=z-10/7 and x-15/3=y-29/8=z-5/-5

21. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.

22.Evaluate $\int_0^5 (x+1)dx$ as a limit of sum.

Section-C

23.Let A = $\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ Using PMI, Prove that $A^n = \begin{pmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{pmatrix}$

24. A wire of length 28m is to be cut into two pieces. One of the piece is to be made into a square and the other into a circle. What should be the length of the two pieces so that the combined area of the square and circle is minimum.

OR

A window is in the form of a rectangle surmounted by a semi-circular opening. The total perimeter of window is 10m. Find the dimension of the window to maximum light through the whole opening.

25.Using integration find the area of the region bounded by the triangle whose vertices are (-1,0),(1,3) and (3,2).

26 .Find the particular solution of the differential equation $x^2dy+(xy+y^2)dx=0$; y=1 when x=1.

OR

Solve the differential equation $(1+y^2)dx=(\tan^{-1} y-x)dy$

27. A man is known to speak truth 3 out of 4 times. He throw a die and reports that it is a 6.Find the probability that it is actually 6.

28. Find the image of the line x-1/3=y-3/1=z-4/-5 in the plane 2x-y+z+3=0.

OR

Find the vector equation to the line parallel to the line x-1/5=3-y/2=z+1/4 and passing (3,0,-4).Also find the distance between these two lines.

29. Nagendra rides his motorcycle at a speed of 25 km/hr. He has to spend Rs.2 per km on petrol.If he rides it at a faster speed of 40 km/hr,the petrol cost increases to Rs.5 per km. He has Rs.100 to spend on petrol and wishes to find what is the maximum distance he can travel within one hour .Formulate it as LPP and solve it graphically.

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Note-This paper is only for practice.