28·07·2016 DE MAZENOD COLLEGE - KANDANA

Grade 12 - 3RD TERM 10-I (3 HRS)

(Combined Maths)

(01) Solve x for $\sqrt{x^2-4x+4}+\sqrt{x^2-4x+1}=5$.

(02) Show $x=4$ when $\log_x 16+\log_2 x=4$.

(03) Find the quadratic Equation whose roots are α and β where $\alpha\beta=2$ and $\frac{1}{\alpha}+\frac{1}{\beta}=3$.

(04) Find the limits

(a) $\lim\limits_{x\to\infty}\dfrac{x}{\sqrt{4x^2+1}-1}$ (b) $\lim\limits_{x\to a}\dfrac{\sin x-\sin a}{x-a}$.

(05) $x^y=e^{x+y}$, then show $\dfrac{dy}{dx}=\left(\dfrac{\ln x}{1+\ln x}\right)^2$.

find $\dfrac{d^2y}{dx^2}$.

(06) Show that $\tan 2A=\dfrac{\tan(A+B)+\tan(A-B)}{1-\tan(A+B)\cdot\tan(A-B)}$

If $\sin(A-B)=-\frac{1}{\sqrt{10}}$, $\cos(A+B)=\frac{2}{\sqrt{29}}$ find $\tan 2A$

where A, B are acute angles.

(07) Write the expansion of $\sin(A+B)$,

If in a triangle ABC $\hat{C}=30°$, $\sin A=3\sin B$

Show that $\cot B=6-\sqrt{3}$

(08) $f(x) = 4x^3 - (3k+2)x^2 - (k^2-1)x + 3$

When $f(x)$ is divided by $(x-k)$ the reminder is Zero.

Where k is a whole number, find the Value of k

When $f(x)$ is divided by $(x-1)$ for this value of k Find the Value of reminder.

(09) Find the set of real values of x satisfying the inequality $\frac{4x}{2x-3} \leq x+1$.

(10) If $y = \cos^2\theta + \sin^4\theta$ show that $y = 1 - \frac{1}{4}\sin^2 2\theta$ Hence when θ varies find the minimum and maximum values of y.

(01)

(a) Differentiate with respect to x

(i) $e^{-2x^2} \times \cos(x \ln x)$

(ii) $x^{\sin x}$

(b) $x = a\cos^3\theta$ $y = a\sin^3\theta$ where a is a Constant Find

$\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ in terms of θ.

Hence show that $3xy\left(\frac{d^2y}{dx^2}\right) = \frac{dy}{dx}\left(x\frac{dy}{dx} - y\right)$

(c) Find the maximum, minimum values of function $y = \frac{(x^3 - 3x + 4)}{(x-3)}$ by using first derivate only

Hence draw the graph of the function.

(02) (i) Show that $(a-b)$ is a factor of expression $bc(b-c) + ac(c-a) + ab(a-b)$

Hence factorize completely.

(ii) when $f(x) = ax^3 + bx + c$ is divided by $(x-2)$, $(x+1)$, $(x+3)$ the reminder is $1, 2, -4$ respectively. find a, b, c. Verify $(x-1)$ is a factor

(iii) Give in Partial fraction

$$\frac{x^2+15x+20}{(x-1)(x+2)^2}.$$

(b) If α, β are the roots of $x^2-2x-1=0$ then find the values of

(i) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$

(ii) $\frac{\alpha^2}{\beta^2}+\frac{\beta^2}{\alpha^2}$

(iii) find the quadratic equation, with roots $\frac{\alpha^2}{\beta^2}, \frac{\beta^2}{\alpha^2}$.

(03) (a) State the sine Rule

Hence in the usual notation, Prove that

(i) $a^3\sin(B-C)+b^3\sin(C-A)+c^3\sin(A-B)=0$ and

(ii) $$\frac{b^2-c^2}{\cos B+\cos C}+\frac{c^2-a^2}{\cos C+\cos A}+\frac{a^2-b^2}{\cos A+\cos B}=0$$

State Cosine Rule.

Find the greatest side of the triangle whose Sides are x^2-1, $2x+1$, x^2+x+1. Then find the greatest angle using cosine Rule.

(04) (a) Let $y = (1+4x^2)\tan^{-1}(2x)$ Show that,

(i) $(1+4x^2)\dfrac{dy}{dx} - 8xy = 2(1+4x^2)$ and

(ii) $(1+4x^2)\dfrac{d^2y}{dx^2} - 8y = 16x$

Find $\left(\dfrac{d^3y}{dx^3}\right)_{x=0}$

(b) A closed right circular cylinder is to be made such that its Volume 1024π cm^3. Find the radius of the cylinder that will make its total surface area a minimum.

(05)
(i) Simplify $\dfrac{1}{(1+x)^{a-b}} + \dfrac{1}{(1+x)^{b-a}}$.

(ii) Solve $\sqrt{\dfrac{a+x}{b+x}} - \sqrt{\dfrac{b+x}{a+x}} = \dfrac{3}{2}$.

(iii) (a) Show that $\log_x y = \dfrac{1}{\log_y x}$ and $\log_a b = \dfrac{\log_c b}{\log_c a}$

(b) Show that $\log_{pq} x = \dfrac{\log_q x}{1+\log_q p}$

28.07.2016 DE MAZENOD COLLEGE - KANDANA.

(Combined M.) Grade 12 - 3RD TERM. - 10 - II (3 HRS)

(01) A train is moving with constant velocity. The driver applies the brakes and brings the train to rest, at uniform retardation of $0.2ms^{-2}$ in 1 minute 30 seconds.

(i) Find the Velocity of the train in kmh^{-1}

(ii) what is the distance the train travelled?

(02) $(\underline{a}+2\underline{b})$, $(5\underline{a}-4\underline{b})$ are two perpendicular vectors that $\underline{a}$, $\underline{b}$ are unit vectors.

(i) Find the angle between vectors $\underline{a}$ and $\underline{b}$

(ii) Find the magnitude of the vectors $(\underline{a}+2\underline{b})$, $(5\underline{a}-4\underline{b})$

(03) A Particle is thrown horizontally with a velocity $\sqrt{gh}$. Show that the inclination to the horizontal at the particle will strike the ground is $\tan^{-1}(\sqrt{2})$.

(04) A stone which falls from rest passes a window 2m high in ½ Second. Find the height above the window from which the stone falls

(Take $g=10ms^{-2}$)

(05) If $\underline{a} = 3\underline{i} - 2\underline{j}$, $\underline{b} = 2\underline{i} + \underline{j}$ and $\underline{c} = 3\underline{i} + \underline{j}$

find the angle θ between $\underline{a}$ and $\underline{b}$

the angle α between $\underline{a}$ and $\underline{c}$

the angle β between $\underline{b}$ and $\underline{c}$

Deduce that $\alpha + \beta = \theta$.

(06) A train is moving along a stright track with a Speed $2u$. when at a point A, due to repairs to the track, the driver reduces the speed of the train to u, applying breaks which produces a constant retardation. After moving with this constant speed u for time t, he increases the speed with a constant acceleration, attaing the former Speed $2u$ at a Point B. If Time taken to travel A to B is T, show that distance from A to B is $\frac{1}{2}(3T-t)u$.

(07) In the quadrilateral ABCD, AB is equal and Parellel DC. using vectors show that BC equal and Parellel to AD.

(08) A boy throws a ball horizontally with a velocity of $15 ms^{-1}$ from the top of a tower 10m high. Find how far from the foot of the tower the ball strikes the ground, and its speed at that moment, by only using velocity - time graph.

(09) A block of mass 20kg is dragged along a Smooth horizontal floor by two strings attached to the block both strings being horizontal If the tension in the strings are 12N and 24N and the angle between the strings is 60°, Find the magnitude and direction of the acceleration of the block.

(10) A Particle when projected with a velocity V can Obtain a maximum Range of 40m. Find the Value of V, the time of flight and the greatest height reached.

01. Train B starts from rest, and accelerates with f from one station. At the same time another Train A travels with constant velocity u. These two trains travels Parellely in the Same direction. Then train B accelerates till it gets the velocity KU where $K>1$. Then deaccelerates with f and comes to rest, In the next station.

(a) Draw the V-t graph for both the motions in the same axis.

(b) Mark the atmost time of meeting as T in the graph.

(c) Show that B can't catch A if $K<\left(1+\frac{1}{\sqrt{2}}\right)$.

02. Two cars A and B, travel two stright roads which intersect at an angle θ.

Car A is moving towards the intersection at a uniform speed of $9\,ms^{-2}$. Car B is moving towards the intersection at a uniform speed of $15\,ms^{-2}$. At a Certain instant each car is 90m from the intersection

(a) Find the distance between the cars when B is at the intersection.

(b) If the Shortest distance between the car is 36m, find the Value of θ.

28.07.2016 Grad 12 3rd Term
Combined Maths.

03 (a) Define $\underline{a} \cdot \underline{b}$ of two vectors $\underline{a}$ and $\underline{b}$

If $|\underline{a}| = 2$, $|\underline{b}| = 3$ and the angle between $\underline{a}$ and $\underline{b}$ is $\frac{2\pi}{3}$ find

(i) $\underline{a} \cdot \underline{b}$

(ii) $|\underline{a} + 2\underline{b}|$ and $|\underline{a} - 2\underline{b}|$

(iii) The angle between $\underline{a} + 2\underline{b}$ and $\underline{a} - 2\underline{b}$

(b) Let $\underline{a}$, $\underline{b}$ and $4\underline{a} - 3\underline{b}$ be position vectors of the points A, B, C repectively, Show that the points A, B, C are collinear.

04. A particle projected at O, with the projection of 45°, and $u\,ms^{-1}$ velocity. It reaches a point P which is R distance from O in the same horizontal plane.

Show that the equation of this motion given by
$$y = x - \frac{gx^2}{u^2}.$$

(i) Show that $R = \frac{u^2}{g}$

the Point Q is in the path of this motion, where $x = \frac{R}{4}$

(ii) find the angle, OQ makes with the horizontal.

(iii) Find the magnitude and direction of the velocity when Particle was at Q.

(iv) Find the ratio OQ : QP