QUESTION ONE(30MKS)DCE 052.

a) Given that when vector A is added to vector B we get 6i + 2k.When vector B is subtracted from A we get 2i + 2j + 6k.Find A and B.
(5MKS)
b) Express moment of inertia in terms of radius of gyration ,hence define radius of gyration.(4mks)
c) What is angular momentum of a rotating body? How is related to torque? (3mks)
d) State the universal law of gravitation, hence define the constant of gravitation. Calculate the mass of the earth using the given values of g,R , and G.
e) Enunciate Newton's third law of motion from the law of conservation of linear momentum. (3mks)
f) A body of mass 0.5kg is rotated in a circle of radius 1metre with a uniform speed of 240 rpm. Calculate the force acting towards the centre. (3mks)
g) The equation for the trajectory of a particle projected upwards with a uniform velocity 'u' and an angle θ '' with the horizontal is given by

$$y = \frac{u2 \sin 2\theta}{2g} = m\underline{(x - {}_{u^2} \sin 2\theta)}$$

g

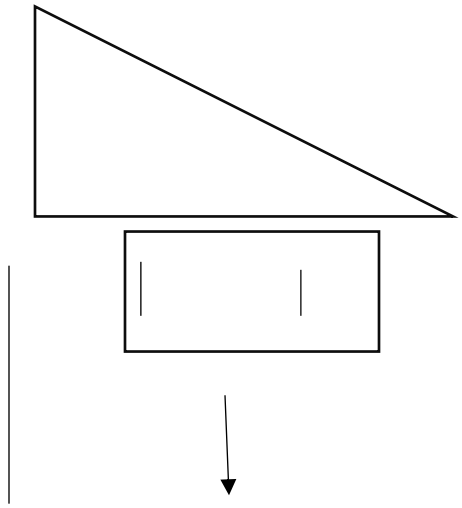
Where 'm' is a constant .Calculate the height and range given u =72km/hr and Q=45^o

h) Show that the electrical oscillations of LC circuit is SHM. Obtain an expression for its frequency. (3mks)

i) A force (i-j) N produces a displacement of (j-k)m what is the work done? Also calculate the angle between the force and the displacement. (3mks)

QUESTION TWO (10MKS)

I) A shop sign is supported from a light pole AB embedded in a wall at A, with a chain CB as shown. The sign weighs 40kg and the tension in the chain is 1000N.Using the dimensions shown, find the couple which will be needed to maintain equilibrium.



Iron ore falls steadily under gravity onto a conveyor belt at a rate of 40 tones a minute. What force is needed to maintain a speed of 1.6m/s in the conveyor belt?

QUESTION THREE (10MKS)

i. A stone of mass 2kg is whirling in a vertical at the end of 0.5m long string. Find the least possible values of velocities at;

A, Highest

B, Lowest

C, Middle positions for the stone to describe a complete circle .

j. Obtain an expression for rotational kinetic energy.

QUESTION FOUR (10MKS)

A motorist s disengages gear and allows his car to free – wheel downhill for 800m along a road. Starting with a speed of 20m/s. The road descends 25m in this distance. If the total mass of the car and passengers is 1600kg and the resistance to motion is 450N, find the speed of the car after 800m.

QUESTION FIVE (10MKS)

I, vector A has component a,b and c. Vector B has components x,y and z. Express A X B in terms of their components and unit vectors i,j and k.

ii. Vector AB,BC and AC form the three sides of a triangle ABC. Show that $\frac{AB}{SineC} = \frac{BC}{SineA}$

Iii, P=3i -2j +4K is perpendicular to q = 6i – 7j + nK . Evaluate n.

QUESTION SIX (10MKS)

Choose any three points in the path of a body falling from a height ‘H’ from the ground and prove that the total energy is conserved.

QUESTION ONE (30MKS)

A) Integrate the following expressions with respect to

I, $\frac{1}{2x}$

Ii

e^{4-5x} Type equation here.

iii, $\frac{3x}{(x-1)(x-2)}$

iv, $\frac{1}{3x+1}$

Find the derivatives of the following from first principles.

I, $cosx$

Ii, $2sinx - 3\,cosx$

Iii, $logx$ $iv,$ $2inx$

C, If $f(x) = \frac{3}{4} - x\ and\ g(x) = \frac{1}{x} find$ $i, (fog)(x)$ $ii, (gof)(x)$

d) Given that log $a^{(m)}$=r and log $a^{1/n}$=s show that m=n a^{r+s}

ii,Express $\frac{2}{(x+1)\left(x^{2}-x-1\right)} into\ partial\ fractions$

iii, if $\log_{10}2$=a show that $\log_{8}5 = \frac{(1-a)}{3a}$

QUESTION TWO (10MKS)

Expand simplify the following function and write down its derivative

$$\sin\left(x + \frac{\pi}{2}\right)$$

QUESTION THREE (10MKS)

Use Simpson's rule to find an approximate value for $\int_0^n \sqrt{\sin\theta}\delta \quad \theta$

QUESTION FOUR (10MKS)

The area enclosed by the curve $y=4x-x^2$ and the line y=3 is rotated about the line y=3.Find the volume of the solid generated.

QUESTION FIVE (10MKS)

I, A spherical balloon is blown up so that its volume increases at aco0nstant rate of $2cm^{3/S}$. Find the rate of increase of the radius when the volume of the balloon is $50cm^3$.

Ii, A vessel containing water is in the form of an inverted hollow cone with a semi vertical angle of 30^0.There is a small hole at the vertex of the core and the water is running out at

arate of 3cm$^{3/f}$ind the rate at which the surface area in contact with the water is changing when there are81πcm^{3}of water remaining in the cone.

QUESTION SIX (10MKS)

Differentiate

I, e^{3x}

ii, $3\sin(e^x)$

iii, $\text{Sin}2x$

Iv, $\frac{1}{x2+1}$

v. $\frac{x-1}{x\sqrt{(x2+1)}}$

MAY INTAKE RESULTS DEC O57

REGISTRATION	X/30	X/70	TOTAL	GRADE
CSE/D/09/14	18	34	52	C
CSE/D/14/14	17	28	45	D
CSE/D/10/14	15	28	43	D

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CSE/D/09/14	18	31	49	D
CSE/D/14/14	19	31	50	C
CSE/D/10/14	25	36	61	B