Introduction

1) Define the terms. (WINTER 2013)
[1] Kinematics [2] Freebody diagram [3] Equilibrunt [4] Couple
[5] Limiting friction [6] Velocity ratio [7] Centrifugal force

2) 1.State and explain " Law of Triangle of forces" 2. Differentiate between (1) Scalar and Vector quantities (2) kinetics and kinematics (June/July2011)

3) A train starts from rest from station 'P' with an acceleration of 2m/Sec..After 10 seconds it attains a maximum velocity and travels with this velocity for next 6 minutes. Finally, it comes to rest by retardation in next 20 seconds at station 'Q'. Calculate maximum velocity attained and distance between two stations P and Q. (January – 2011)

4) Compare the equations of linear motion with that of angular motion by giving atleast seven points. **(WINTER 2013)**

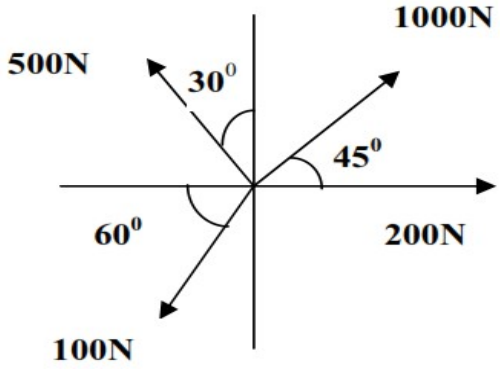
5) A body is projected vertically upwards with a velocity of 49 m/s from ground. Find
(1) Maximum height and time to obtain maximum height (2)Total time when body will return to ground. (Jan. 2012)

6) Explain with neat sketch (1)Velocity-Time diagram (Jan. 2012)
(2)Super elevation

7) State Triangle Law of forces and give one example. (**WINTER 2012)**

Coplanar Concurrent Forces

7) Find magnitude and direction of the resultant force of the force system as shown in fig. (June/July2011)



8) State Law of parallelogram,law of Triangle and give one example of both. **(June/July2011)**

9) A body is projected vertically upwards with a velocity of 49 m/s From ground.Find
[1] the time taken to obtain velocity of 29.4 m/s.
[2] the time & height when it reaches to max. height.
[3] total time when it will reach to ground. **(WINTER 2013)**

10) Determine the max. & min. resultant of two forces having magnitudes 10 N

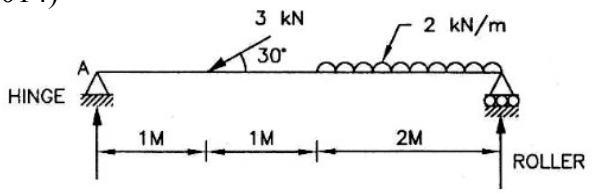
& 8 N respectively. (07)

11) Two tensile forces of 100kN and 80kN are acting at a point with an angle of 120^0 between them. Find magnitude and direction of the resultant force.(**Jan. 2012)**

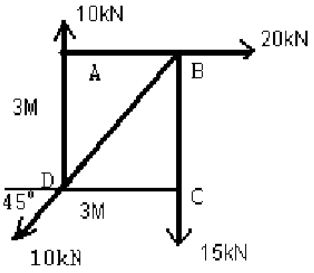
12) State the conditions of equilibrium.
13) Find magnitude of two forces such that if they act at right angle, their resultant is 90 N and when they act at 60_o, their resultant is 117 N.

Coplanar Non-Concurrent Forces

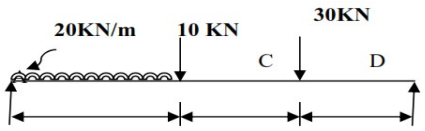
10) Calculate reactions offered by the supports of the beam as shown in Fig. (SUMMER 2014)



11) Find resultant and its direction for forces given in fig: **(SUMMER 2014)**



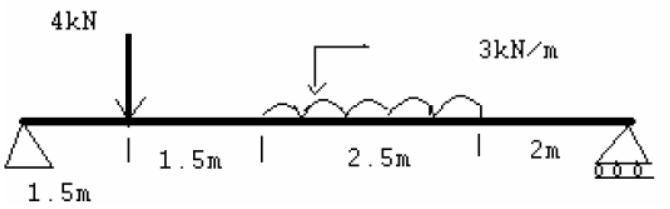
12) Find support reactions for a beam as shown in fig. (Jan. 2012)



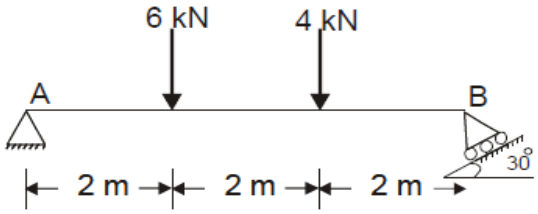
13) A railway engine weighing 450 kN is running over a circular track having a radius of 260 metres, with a velocity of 100 km/hr. Calculate centrifugal force acting on the engine. (**JUNE/JULY- 2012)**

14) Define couple and state properties of couple.

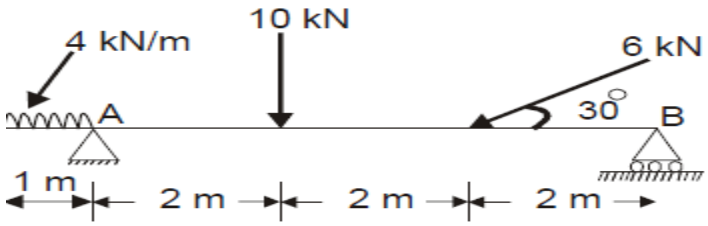
15) Find support reactions for beam shown in fig.



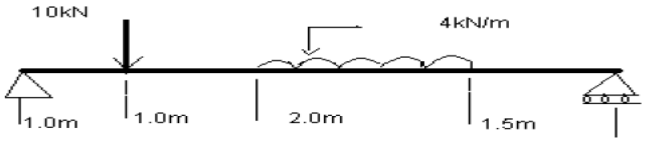
16) Find support reactions for a beam shown in **figure**



17) Find support reactions for a beam shown in **figure**

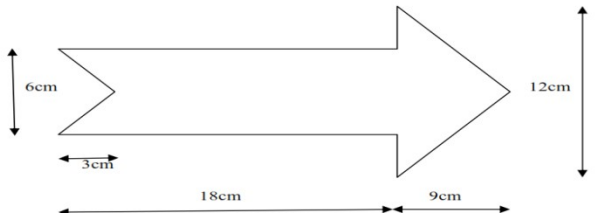


18)) Find support reactions for beam shown in fig.



Centroid & Centre of Gravity

14) Find the C.G. for the fig. (Jan. 2012)



15) Find position of centroid for the fig. shown in fig. (January – 2011)

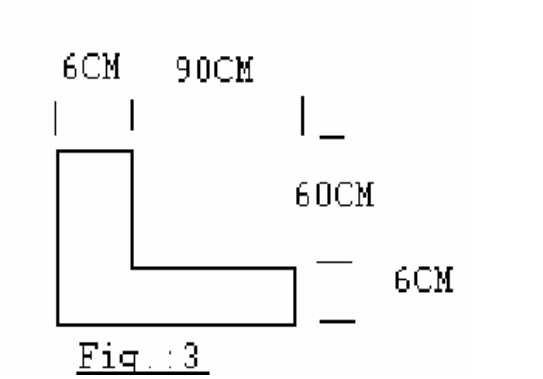
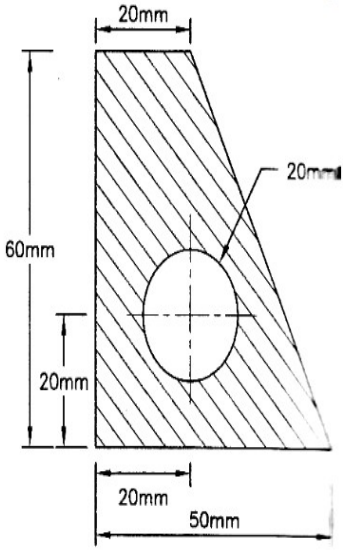


Fig. : 3

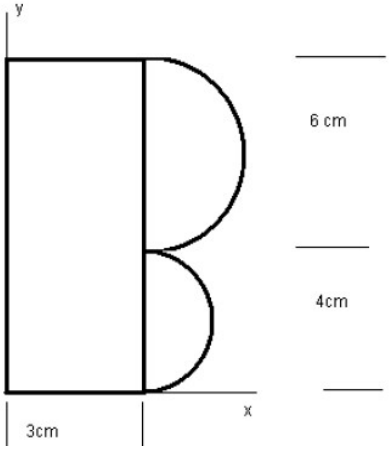
Find out the centroid of the shaded area as shown in Fig.



17) Differentiate between centroid and centre of gravity. **(SUMMER 2014)**

18) Find centroid of a wire making equilateral traingle of 80mm side.

19) Find position of centroid for the fig. shown in fig.



Friction

18) Find horizontal force required to push a body weighing 20kN up aramp inclined 30° with horizontal. Take friction coeff. = 0.25 (WINTER 2012)

19) A block weighing 40 N rests on a plane inclined at 12^0 with the horizontal. If θ = 0.26, find the minimum force required to cause upward motion of the block.

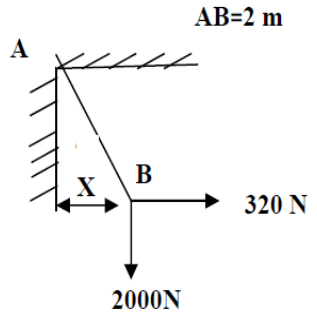
(SUMMER 2014)

20) Define friction and explain laws of friction.

21) A block weighing 360N rests on a rough horizontal floor. A force of 120 N inclined at 60_o with the floor is just sufficient to move it. Find co efficient of friction between floor and block.

22) A pull of P inclined at 30_0 to the horizontal is necessary to move a wooden block of 250N weight placed on horizontal table. If coefficient of friction μ = 0.2, find pull 'P'

23) A Body weighing 2000 N is suspended from a vertical wall by a string AB 2m long as shown in fig.2. It is pulled by a horizontal force of 320N. Find tension (T) in the string AB and lateral displacement (x) of the body.



18) A block weighing 360N rests on a rough horizontal floor. A force of 120 N inclined at 60o with the floor is just sufficient to move it. Find co efficient of friction between floor and block.

19) A block of weight 200 N is placed on a rough inclined plane. The inclination of plane with horizontal is 30o.If co-efficient of friction is 0.25, calculate the force that is applied parallel to slope of plane to move the block upwards.

20) A body projected at an angle of 30^0 with horizontal with a velocity of 25 m/s. Calculate maximum height, Horizontal range & total time taken for flight. (**SUMMER 2014)**

21) . determine the magnitude of horizontal force P, required to start the block to move up the plane

1. Equilibrium of block is maintained by a pull P as shown in fig. The co-efficient of friction between block and surface is 0.2. Determine the values of P for which the block remains in equilibrium.
2. What should be the value of θ in the fig. which will make the motion of 1000 N block down the plane to impend? The co-efficient of friction for all contact surfaces is 1/3.

3. Two blocks of weight 50 N and 200 N are connected by a cord and rest on two inclined planes as A block of mass 100 kg is placed on an inclined plane as shown in fig. If μ_s= 0.35 & μ_k= 0shown in fig. Determine the maximum tension in the cord when limiting friction conditions develop for both the blocks.
4. A body of weight 100 N rests on a rough horizontal plane (μ=0.3). Find the minimum force P and its inclination to set the block into impending motion.

Work, Powe & Energy

19) A pump lifts 5000 liter of water from ground level to a 25m high tank in 10 minutes. Find the power of pump in kW. (WINTER 2012)

20) Explain Work, Power and Energy with their units. (JUNE/JULY-2012)

21) A water tank of 25000 liter capacity is filled up in 40 minutes by a pump.Water is lift through a height of 25 m. Calculate the power required by the pump in KW. **(SUMMER 2014)**

22) Compare the equations of linear motion with that of angular motion by giving atleast seven points.(**WINTER 2013)**

23) In a construction of concrete dam of 50 m height,concrete is lifted from base of the dam by a bucket 5 kN & rope of weight 80 N/m.Calculate the work done in lifting one bucket of concrete.

24) Draw V-T dia. for acceleration 0.5, 1.0, 2.0 m/sec^2

25) A Truck of mass 2.5 kN runs with a velocity of 36 kmph. Compute its kinetic energy.

.Simple Machines

22) Explain law of machine and define mechanical advantage, velocity ratio and efficiency. – (WINTER 2012)

23) In a machine an effort of 1 kN raised a load of 8 kN. The Distance moved by the effort was 20 meters while that moved by the load was 1 metre. Find Mechanical advantage, Velocity ratio and efficiency of the machine. (JUNE/JULY-2012)

24) In a simple machine an effort of 157 N raised a load of 1200 N and an effort of 382 N raised a load of 3000 N. Establish the law of machine and find effort required to lift a load of 8000 N.

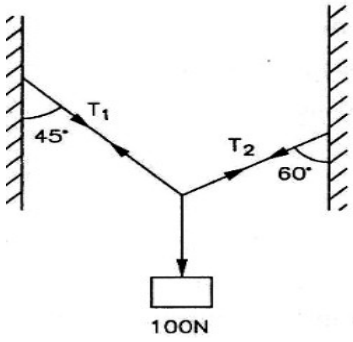
25) Define (1) Velocity ratio (2) Mechanical advantage (3) Input of a machine (4) Output of a machine (5)Efficiency (6)Reversiblemachine(7) Self locking machine **(June/July2011)**

26) Explain law of machine. **(SUMMER 2014)**

27) In a simple machine an effort of 157 N raised a load of 1200 N and an effort of 382 N raised a load of 3000 N. Establish the law of machine and find effort required to lift a load of 8000 N. **(JUNE/JULY- 2012)**

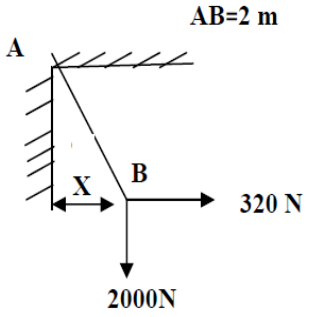
28) For a simple lifting machine, Law of machine is P = 0.1W + 3.5. If VR=30.5, find maximum efficiency and maximum mechanical advantage of machine. State whether the machine is reversible or not. Find effort required to lift a load of 50 kN. (Jan. 2012)

29) A box weighing 100 N is hung with the help of strings as shown in Fig.3.Find tensions in both the strings. (**SUMMER 2014)**



30) Define reversible machine. .(**WINTER 2013)** (7)

31) In a lifting machine an effort of 30 kg lifts a load of 720 kg . What is the mechanical advantage, if efficiency of machine is 40% at this load. Calculate velocity ratio of machine.



32) In a lifting machine a load of 20kN is lifted by an effort of 0.6kN and a load of 40kN is lifted by an effort of 1.10kN. Find law of machine and efficiency at load 40kN & VR=40.

33)A pump lifts 4000 liter of water from ground level to a 15m high tank in 10 minutes. Find the power of pump in kW.

34)A water tank of 5000 litre capacity is at a height of 15 m from ground level. If it is required to be filled up by pumping water from ground level in 10 minutes. Find power required for the pump in KW.

35)A water tank having capacity of 25,000 litres is to be filled up in 30 minutes. The water is to be lifted through a height of 20 metres. Find power of a pump in kW required to fill the tank if pump's efficiency is 75% .

36) Explain the condition of reversibility of machine. .(**WINTER 2013)**

37) In a simple machine an effort of 157 N raised a load of 1200 N and an effort of 382 N raised a load of 3000 N. Establish the law of machine and find effort required to lift a load of 8000 N.

38) A flywheel increases its speed from 100 RPM to 200 RPM in 30 seconds. Find angular Acceleration and no. of revolutions made by the wheel during this time.