FE/Sem-I/All Branches.
Engineering mechanics.

Con. 5625–10.

18/12/10

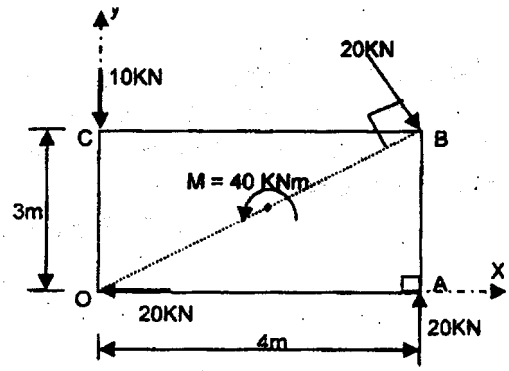
GT–7800

(3 Hours) **[Total Marks : 100**

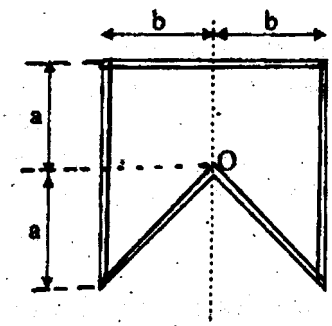
N.B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** questions out of remaining **six.**
(3) Assume **suitable** data if **necessary** stating them **clearly.**
(4) Take g = 9·81 m/s^2.
(5) Draw **suitable** sketches where **necessary.**

Qn 1. Answer any Four

1A). Find the resultant of the force system acting on a body OABC, shown in figure. Also find the points where the resultant will cut the x and y axis. What is the distance of resultant from O? **(05 Marks)**



1B). Determine the ratio a/b for which centroid will be located at point 'o' for a wire bent as shown in Fig. **(05 Marks)**

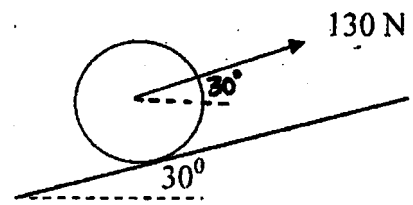


1C). The velocity of a particle travelling in a straight line is given by v = 6t - 3t^2 m/s. Where t is in seconds. If s = 0when t = 0, determine the particle's deceleration and position when t =3s. How far has the particle travelled during the 3 second time interval and what is its average speed? **(05 Marks)**

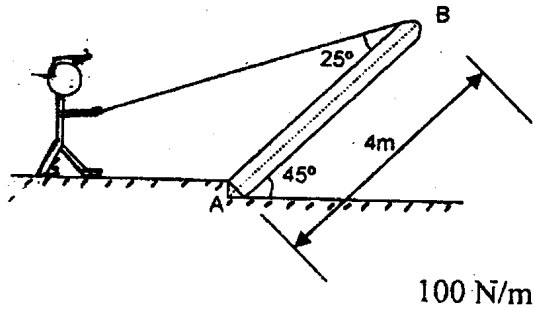
1D). A boy throws a ball vertically downwards from a height of 1.5m. He wants the ball to rebound from floor and just touch the ceiling of room which is at a height of 4m from ground. If coefficient of restitution e is 0.8, find the initial velocity with which the ball should be thrown. **(05 Marks)**

1E). A 5 Kg mass drops 2m upon a spring whose modulus is 10N/mm. What will be the speed of the block when the spring is deformed 100mm? **(05 Marks)**

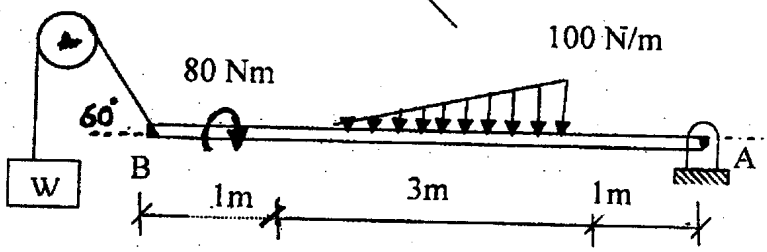
1F). Find the work done in rolling a 20Kg wheel a distance 1.5m up a plane inclined 30^0 with the horizontal as shown in figure. Assume coefficient of friction as 0.25. **(05 Marks)**



2A). A man raises a 12kg joist of length 4m by pulling the rope. Find the tension in the rope and the reaction at A. **(08 Marks)**

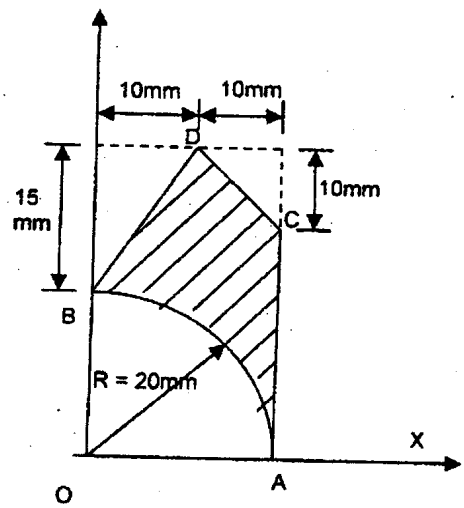


2B). Determine minimum weight of block required to keep the beam in horizontal equilibrium. Assume rough pully with coefficient of friction as 0.2. **(12 Marks)**

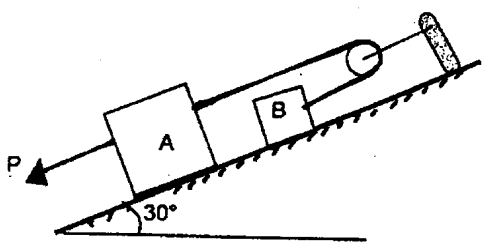


3A). State Varignon's Theorem. **(02 Marks)**
3B). State the assumptions made in the analysis of truss. **(02 marks)**
3C). State Work Energy Principle & Law of conservation of Momentum principle. **(04 marks)**

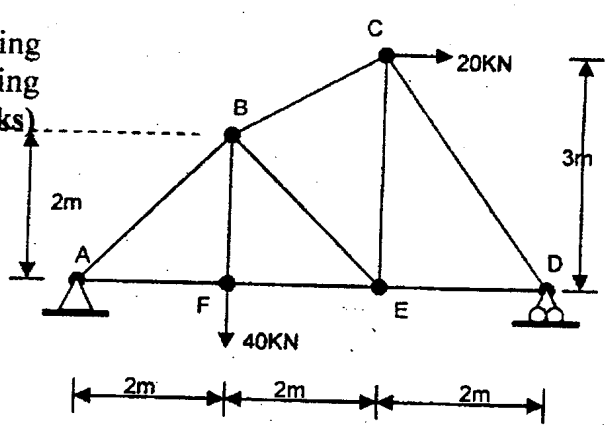
3D). Find centroid of plane area & also MI about centroidal axis. **(12 Marks)**



4A). Determine the force 'P' to cause motion to impend. Take masses of blocks A and B as 8kg and 4kg respectively and the coefficient of sliding friction as 0.3. The force 'P' and rope are parallel to the inclined plane. Assume frictionless pulley. **(08 marks)**

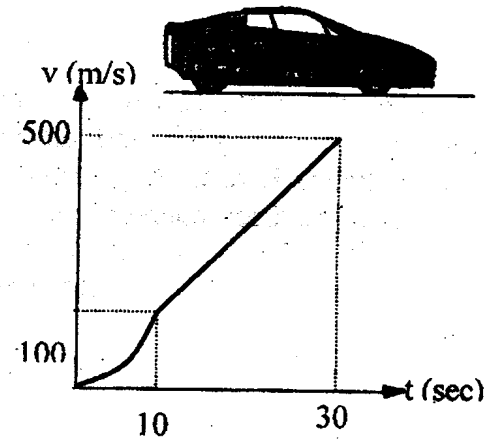


4B). Find Forces in truss members BF, BE using method of section and other members using method of joints. **(12 Marks)**



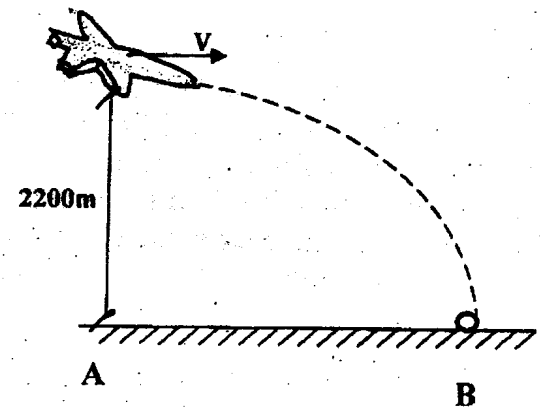
5A).The acceleration of the particle is defined by the relation $a = 25 - 3x^2$ mm/s^2. The particle starts with no initial velocity at the position x = 0. (a) Determine the velocity when x = 2mm (b) the position when velocity is again zero (c) position where the velocity is maximum and the corresponding maximum velocity. **(08 marks)**

5B) A car moves along a straight road such that its velocity is described by the graph shown in figure. For the first 10 seconds the velocity variation is parabolic and between 10 seconds to 30 seconds the variation is linear. Construct the s-t and a-t graphs for the time period $0 \leq t \leq 30$s. **(12 marks)**



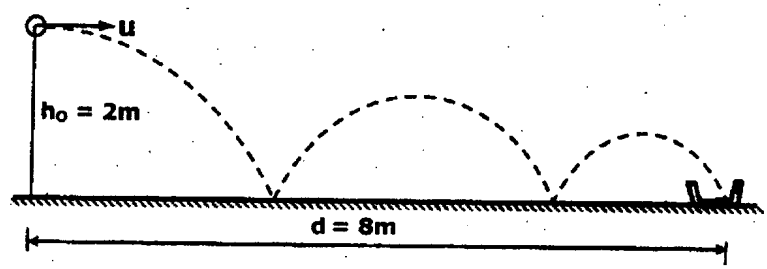
6A). An aeroplane is flying in horizontal direction with a velocity of 540km/hr and at a height of 2200m. When it is vertically above the point A on the ground, a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB (ignore air resistance). Also find velocity at B and time taken to reach B.

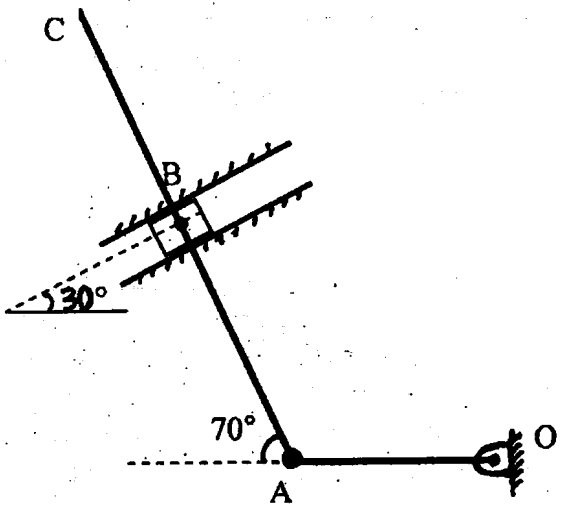
(08 marks)



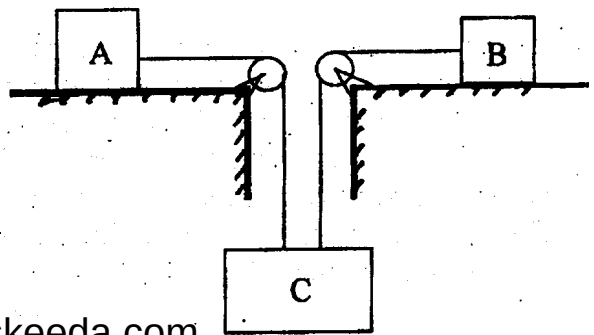
6B). A small steel ball is to be projected horizontally such that it bounces twice on the surface and lands into a cup placed at a distance of 8m as shown. If the coefficient of restitution for each impact is 0.8, determine the velocity of projection 'u' of the ball.

(12 marks)





7A) Locate the instantaneous centre of rotation for the link ABC and determine Velocity of Points B & C. Angular velocity of rod OA is 15rad/sec counter clock wise. Length of OA is 200 mm, AB is 400 mm and BC is 150mm. **(08 marks)**



7B) Masses A(5kg), B (10kg), C (20kg) are connected as shown in the figure by inextensible cord passing over massless and frictionless pulleys. The coefficient of friction for masses A and B with ground is 0.2. If the system is released from rest, find the acceleration of the blocks and tension in the cords. **(12 marks)**