



Printed Pages : 4

AG – 122

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4036

Roll No.

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B. Tech.

(SEM. II) EXAMINATION, 2006-07

ENGINEERING MECHANICS

Time : 3 Hours]

[Total Marks : 100

- Note :*
- (1) Attempts **all** questions. Assume suitable data if required.
 - (2) All questions carry **equal** marks.

- 1 Attempt any **four** parts of the following:-
- (a) Define the law of parallelogram of forces. What is the use of this law?
 - (b) Forces of 2, $\sqrt{3}$, 5, $\sqrt{3}$, 2 act at an angular point of a regular hexagon towards the other angular points taken in order, find their resultant.
 - (c) A simply supported beam of span 10 m is carrying a point load of 100 N at a distance 4 m from one end. Determine the beam reactions.
 - (d) A particle of O is acted by following forces :
 - (i) 200 N inclined 30° with east towards north
 - (ii) 250 N towards the north.
 - (iii) 300 N towards north west
 - (iv) 350 N inclined at 40° with west towards south.Find the resultant of all these forces and its direction.

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- (e) Find a horizontal forces and force inclined at an angle 60° with the vertical whose resultant shall be a given vertical force F .
- (f) Define and explain the following terms:-
 - (i) Coplanar and non coplanar
 - (ii) Collinear and concurrent forces
 - (iii) Parallel and non parallel forces.

2 Attempt any **four** parts of the following :

- (a) Find the forces in the member AB, AC and BC of the truss shown in Fig.1 by method of joints.

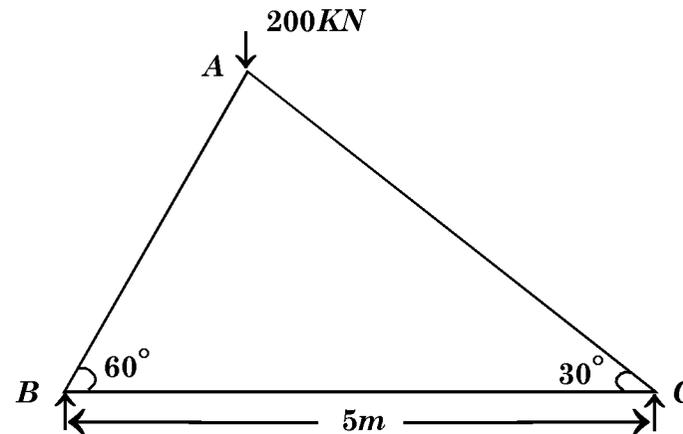


Fig. 1

- (b) Explain the term 'support reactions'. What are the different types of support?
- (c) Explain and define the term "free body diagram". Draw the free body diagram of a ball of weight W placed on a horizontal surface.
- (d) Find the forces in the members AB and AC of the truss shown in **fig. 2**.

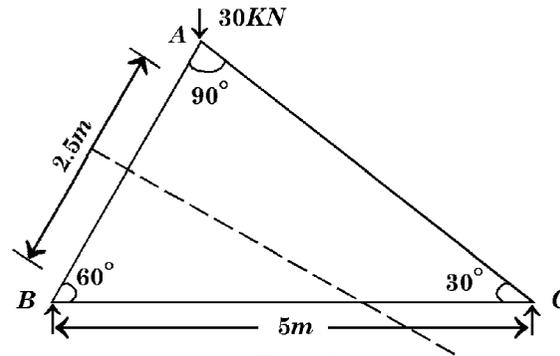


Fig. 2

using method of section.

- (e) A simply supported beam AB of span 10 m carries two point loads of 15 kN and 20 kN at 4 m and 6 m from the end A respectively. Determine the beam reactions by the principle of virtual work.
- (f) What are the applications of the principle of virtual work?

3 Attempt any **two** parts of the following :

- (a) Find the force required to drag a body of weight W , placed on a rough inclined plane having inclination α to the horizontal. The force P is applied to the body horizontally and the body is :
 - (a) on the point of motion up the plane.
 - (b) On the point of motion down the plane.
- (b) A load of 2 kN is to be lifted by a screw jack, having threads of 10 mm pitch. The efficiency of the jack at this load is 50%. Determine the effort applied at the end of a handle of 50 cm length.
- (c) What load will be lifted by an effort of 12N if the velocity ratio is 18 and efficiency of the machine at this load is 60%? If the machine has a constant frictional resistance, determine the law of machine and find the effort required to run the machine at a load of 90N.

- 4** Attempt any **two** parts of the following :
- (a) Determine the moment of inertia about xx – axis and yy-axis for the unequal angle section 200 x 100 x 10mm
 - (b) A body falling freely under the action of gravity passes two points 20 m apart vertically in 0.4 sec. from what height above the higher point, did the body start to fall? Take $g=9.8 \text{ M/sec}^2$.
 - (c) A particle is projected at such an angle with the horizontal that the horizontal range is four times the greatest height attained by the particles. Find the angle of projection.

- 5** Attempt any **two** of the following :
- (a) Two bodies of different weights are connected to the two ends of a light inextensible string, which passes over a smooth pulley. If the acceleration of the system is 3 m/s^2 and bigger weight is 60N. Determine.
 - (i) The smaller weight, and
 - (ii) Tension in the string. Take $g=9.80\text{m/s}^2$.
 - (b) The radius of gyration of a flywheel which weights 6 kN, is 50 cm. If the wheel starts from rest and attains a speed of 200 r.p.m in 2 minutes, determine the average torque exerted on the flywheel.
 - (c) A body, moving with simple harmonic motion, has an amplitude of 1m and period of complete oscillation is 2 seconds. Find the velocity and acceleration of the body $\frac{2}{5}$ of a second after passing the mid-position.