

Engineering Mechanics

Prelim Question Paper

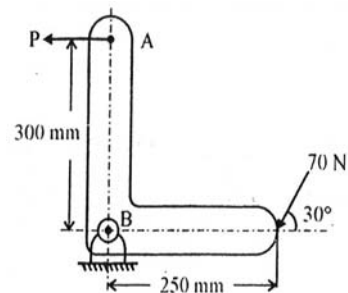
Time : 3 Hrs.]

[Marks : 100

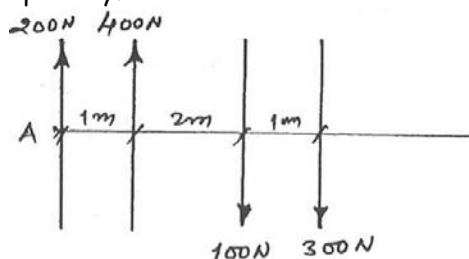
- Instructions :**
- (1) All questions are compulsory.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Preferably, write the answers in sequential order.

1. Attempt any **TEN** of the following : [20]
- (a) Difference between mass and weight?
 - (b) State Newton's Laws of motion? (First, Second & Third)
 - (c) Define Resolution of force.
 - (d) Define effort and effort lost in friction.
 - (e) What is polar diagram?
 - (f) State types of friction.
 - (g) State principle of transmissibility of force.
 - (h) What is Bow's notation ? Explain with a sketch.
 - (i) Explain meaning of self locking machine. State the condition for it.
 - (j) State velocity ratio for screw jack with meaning of term involved.
 - (k) What is coefficient of friction?
 - (l) What is efficiency of a machine?

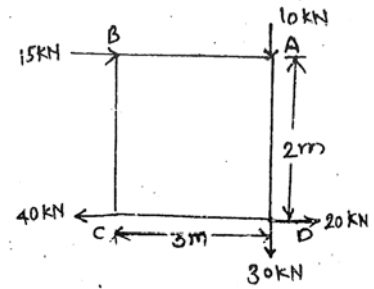
2. Attempt any **FOUR** of the following : [16]
- (a) Resolve the force 19 MN along 22° and 32° on either side of it.
 - (b) In a simple axle and wheel, the diameter of wheel is 180 mm and that of axle 30 mm. If the efficiency of the machine is 80%, find the effort required to lift a load of 100 N.
 - (c) Write the different types of force system.
 - (d) A screw jack of pitch 8 mm a lever of 250 mm length if the efficiency of machine is 30%, find the effort required to lift a load of 1500 N.
 - (e) For a general pulley block number of cogs on effort wheel is 24, that of on load wheel is 6 No. of teeth on the pinion is 4 and that of on spur is 36. If the maximum effort, which can be applied is 60 N, calculate the maximum load that can be lifted, if efficiency of machine is 80%.
 - (f) A crank ABC with system of forces acting on it is shown in figure. Find force "P" to maintain equilibrium.



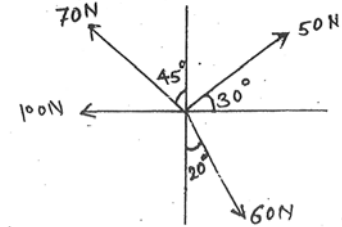
3. Attempt any **FOUR** of the following : [16]
- (a) Determine the magnitude of resultant and position of it wrt point A for the force system shown in Figure. Solve it graphically.



- (b) Calculate the moment about point 'B' for the force system as shown in Figure.



- (c) Calculate the magnitude and direction of resultant for concurrent force system as shown in Figure. Use analytical method.

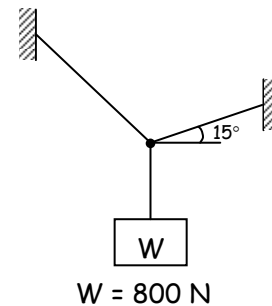


- (d) Four forces 20N, 15N, 30N, & 25N are acting at 0° , 60° , 90° & 150° from x-axis taken in order. Find resultant by analytical method.
 (e) Find the angle between two forces of magnitude 120 N each, such that their resultant is 60 N.
 (f) What are the components of 60 N force acting horizontal, in two directions on either side at an angle of 30° each?

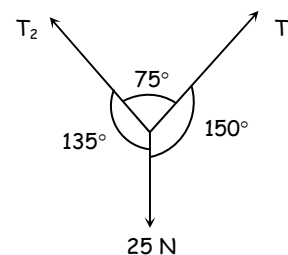
4. Attempt any **FOUR** of the following :

[16]

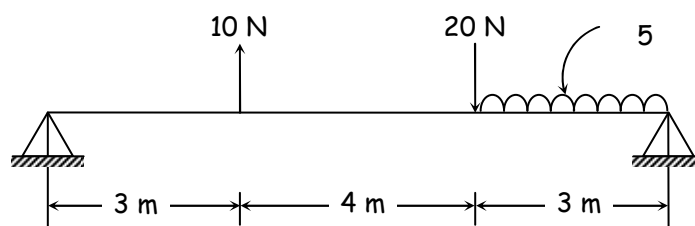
- (a) A sphere of weight 400 N rests in a groove of smooth inclined surfaces which are making 60° and 30° inclination to the horizontal. Find the reactions at the contact surfaces.
 (b) Check whether a wire having capacity of 600 N can lift a load of 800N if it is attached as shown in Figure.



- (c) A beam AB of 9m span is simply supported at ends. The beam carries point load of 2kN upwards at 2m from A and uniformly distributed load of 1000 N/m downwards on a length of 6m from B. Determine support reactions analytically.
 (d) Find the tensions in the string as shown in figure.



- (e) Two men carry a weight 200 N by means of ropes fixed to the weight. One rope is inclined at 45° and other 30° with the vertical. Find tension in each side of rope.
 (f) Find the support reactions of simply supported beam shown in figure.



5. Attempt any **FOUR** of the following :

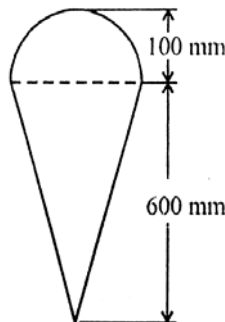
[16]

- (a) A Ladder of weight 400N and length 10m is supported on smooth wall with its lower end 4m from the wall. The coefficient of friction between the floor and the ladder is 0.3. Show the forces acting on the ladder and find frictional force at floor.
- (b) For a certain machine an effort of 100 N and 150 N can lift a load of 1 kN and 2kN respectively. Find the law of machine. Also calculate maximum efficiency if VR is 20.
- (c) A block of weight 500 N is placed on a inclined plane at an angle of 20° with the horizontal. If coefficient of friction is 0.14, find the force 'P' applied Parallel to the plane, just to move the body up the plane.
- (d) The velocity ratio of a certain machine is 72. The law of machine is $P = \left(\frac{1}{48} W + 30 \right) N$. Find the maximum mechanical advantage and maximum efficiency. State also whether the machine is reversible or not.
- (e) A block of 80 N is placed on a horizontal plane where the coefficient of friction is 0.25. Find the force at 30° up the horizontal to just move the block
- (f) Find the horizontal force required to drag a body of weight 100 N along a horizontal plane. If the plane is raised gradually upto 15°, the body will begin to slide.

6. Attempt any **FOUR** of the following :

[16]

- (a) Locate the centroid of angle section 90 mm × 100 mm × 10 mm. (90 mm side is vertical.)
- (b) Find the centroid of the I-section with following details.
 - (i) Top flange = 200 mm × 10mm
 - (ii) Bottom flange = 100 mm × 20 mm
 - (iii) Web thickness = 15 mm
 - (iv) over all depth = 250 mm
- (c) A wall of height 6m has one side vertical and other inclined. The top thickness is 1 m and bottom thickness is 4 m. Find its centroid.
- (d) A square of 400 mm side from which a circle of 400 mm diameter is cut-off from the centre. Find centroid of the remaining area.
- (e) Locate the position of centroid of an ice-cream cone as shown in figure.



- (f) The frustum of a cone has top diameter 40 cm and bottom diameter 60 cm with height 18 cm. Calculate \bar{Y} only.

Paper Discussion Schedule for all Subject: FY Diploma Sem-II

Date	Day	Timing	Centre
9 April 2017	Sunday	9 a.m. to 11 a.m.	Dadar
9 April 2017	Sunday	12 p.m. to 2 p.m.	Thane
9 April 2017	Sunday	9 a.m. to 11 a.m.	Ghatkopar
9 April 2017	Sunday	12 p.m. to 2 p.m.	Borivali
9 April 2017	Sunday	12 p.m. to 2 p.m.	Nerul
9 April 2017	Sunday	3 pm to 5 pm	Kalyan