

Sample Test Paper - I

Course Name : Civil, Chemical, Mechanical and Electrical Engineering Group

Course Code : AE/CE/CH/CR/CS/CV/EE/EP/FE/ME/MH/MI/PG/PT/PS

Semester : Second

Subject Title : Engineering Mechanics

Marks : 25

17204

Time: 1 Hrs.

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

Q.1 Attempt any THREE.

09 Marks

- a) Define efficiency of Machine and state its relation with M.A & V.R.
- b) Define force and state its characteristics.
- c) State the Law of Parallelogram of forces and its use.
- d) What is funicular polygon and polar diagram? State their use.
- e) Define moment and state law of moment.

Q.2 Attempt any TWO.

08 Marks

- a) A certain lifting machine has V.R=150. A load of 2.4KN is lifted by an effort of 50N, while an effort of 65N is required to lift the load of 4.2KN. Find the efficiency of the machine if the load to be lifted is 3KN.
- b) How the friction does affect the performance of the machine? Defining the terms load lost in friction & effort lost in friction derive expression for them.
- c) A force of 900N passes through origin towards the point (12, 5). Find its orthogonal components.

Q.3 Attempt any TWO.

08 Marks

- a) Find magnitude and direction of the resultant of the following forces acting away from the point. 50N @ 30°, 20N @ 130°, 30N @ 220°, 40N @ 270°, & 10N @ 315° from + x axis analytically.
- b) An equilateral triangle ABC of side 1m carries 3 forces of magnitude 1KN each along AB, BC, CA. Find magnitude, direction & position of the resultant w.r.t.A if BC is base of the triangle.
- c) Solve **3a** graphically.

Sample Test Paper - II

Course Name : Civil, Chemical, Mechanical and Electrical Engineering Group

Course Code : AE/CE/CH/CR/CS/CV/EE/EP/FE/ME/MH/MI/PG/PT/PS

Semester : Second

Subject Title : Engineering Mechanics

Marks : 25

17204

Time: 1 Hrs.

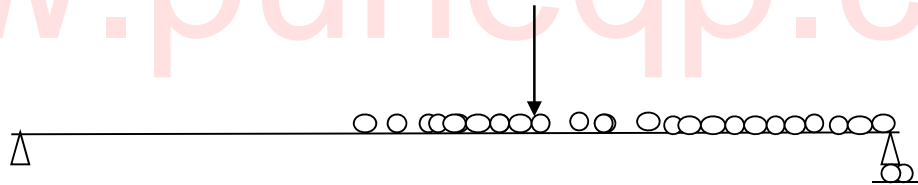
Instructions:

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.

Q.1 Attempt any THREE

9 Marks

- a. Define Equilibrant. State the relation between equilibrant and resultant.
- b. Two men carry a weight of 2 kN by means of two ropes fixed to the weight. One rope is inclined at 45° and the other at 30° with their vertices. Find the tension in each rope.
- c. Calculate the reaction at supports of the simply supported beam shown in Fig. 1 analytically



- d) Determine the reaction for the beam shown in Fig. 1 by graphical method

Q.2 Attempt any TWO

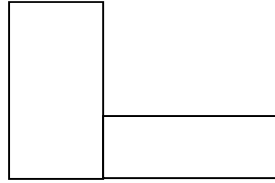
8 Marks

- a) Define angle of friction and state the relation between angle of friction, angle of repose and coefficient of friction
- b) A block of weight 200 N is resting on rough horizontal surface having coefficient of friction as 0.22. It is just moved by a force P inclined at 25° to the horizontal. Calculate magnitude of force P .
- c) A body of weight 300N is resting on the rough horizontal ground is just pushed by a force of 75N applied at an angle of 30° to the horizontal. Calculate the coefficient of friction & reaction of the plane.

Q.3 Attempt any TWO

8 Marks

- a) Determine the centroid of a 'T' section having flange as 300 mm X 50 mm and web as 400 mm X 50 mm.
- b) Determine the centroid of a lamina shown in Fig. 2



- c) A body consist of right circular cone of height 40 mm and radius 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the positions of centre of gravity of the body

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Sample Question Paper

Course Name : Civil, Chemical, Mechanical and Electrical Engineering Group

Course Code : AE/CE/CH/CR/CS/CV/EE/EP/FE/ME/MH/MI/PG/PT/PS

Semester : Second

Subject Title : Engineering Mechanics

Marks : 100

17204

Time: 3 Hrs.

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.

Q.1 Attempt any TEN of the following

20 Marks

- a) Define simple & compound machine.
- b) Define load & effort.
- c) Define mechanical advantage & velocity ratio.
- d) Define force & state its SI unit.
- e) State the example of application of Engineering Mechanics in our day to day life.
- f) State the law of transmissibility of force.
- g) What is space diagram & vector diagram?
- h) State the analytical conditions of equilibrium for non concurrent force system.
- i) State Lami's Theorem & give its expression.
- j) Define coefficient of friction.
- k) State the relation between angle of friction & angle of repose.
- l) Find V.R for a differential axle & wheel if $D=230\text{mm}$, $d_1=25\text{mm}$, $d_2=15\text{mm}$.

Q2. Attempt any FOUR of the following

16 Marks

- a) In a certain lifting machine a load of 1KN is lifted by an effort of 25N, while load moves up by 100mm an effort moves up by 8m. Find M.A, V.R & efficiency of the machine.
- b) In a single purchase crab winch number of teeth on pinion is 25 & that on spur wheel are 100. Radii of drum & handle are 50mm & 300mm respectively. Find the efficiency of machine & effort lost in friction if effort of 20N can lift a load of 30N.
- c) A simple screw jack has thread of pitch 12mm. Find the effort required to lift the car load of 3KN if the length of handle is 500mm & efficiency is 50%.
- d) Find the orthogonal components of the following forces. 200N @ NE, 350N @ 30° west of south, 20KN due south, 40KN due south.
- e) Resolve the force of 500N along 20° & 30° on either side of it.
- f) State the Graphical conditions of Equilibrium for non concurrent force system.

Q3. Attempt any FOUR of the following

16 Marks

- a) Five forces of magnitude 1N, 3N, 5N, 7N and 9N starting from one corner of regular hexagon and acts toward its other corner taken in anticlockwise order. Determine

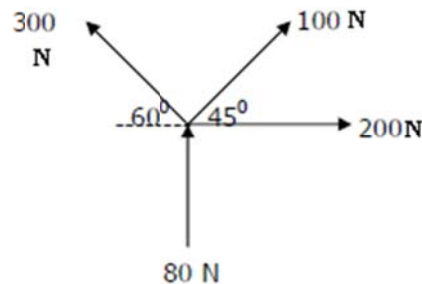
magnitude and direction of resultant analytically. (regular hexagon placed such that its one of the side is horizontal)

- Determine the resultant analytically of four like parallel forces having magnitude 60kN, 85kN, 55kN, 95kN spaced 1.4m, 1.6m and 0.9m horizontally such that their inclination with horizontal is 60° .
- Solve 3b graphically.
- Determine the magnitude & direction of the resultant analytically for a force system having following forces & their coordinates. 160N from (-3, 2) to (-4, -2), 240N from (6, 0) inclined @ 50° with horizontal, 135N from (0, -4) to (5, -4).
- Solve 3a graphically
- Two forces of magnitude 80N and 120N having included angle 60° . Determine magnitude & direction of the resultant.

Q.4 Attempt any FOUR of the following

16 Marks

- Determine the equilibrant in magnitude and direction for the following force system.



- A uniform sphere of weight 1000N rest between a smooth vertical plane & a smooth plane inclined at angle of 40° with vertical plane. Determine the reactions at all contact surfaces.
- A simply supported beam of span L m subjected to udl of intensity w kN/m spread over left half span. Determine the end reactions.
- A beam of span 4m having left end hinged & right end roller support inclined at 40° with horizontal carries udl of intensity 150kN/m over entire span along with a point load of magnitude 100kN inclined at 30° in anticlockwise direction at the centre of the span. Determine the support reactions analytically.
- An electric bulb weighing 25N hangs from a ceiling by two strings AC & BC, where AC is inclined at 60° to the ceiling & BC at 40° to the vertical wall at B determine the forces in the strings AC & BC.
- Solve Q. 4 d) graphically.

Q.5 Attempt any FOUR of the following

16 Marks

- A body of weight 120 N rest on a horizontal rough surface. Find the magnitude of the force to be applied at an angle of 30° to the horizontal in order to just move the body on the surface. Assume $\mu = 0.3$
- A block weighing 200 N a resting on a rough horizontal plane. If $\mu = 0.35$ Calculate the force required to move the block, if the force applied is
 - parallel to the plane
 - pull at 30° to the plane
- A block weighing 36 N is resting on a 30° inclined rough plane. A force of 12 N inclined at 10° to the plane is applied to the block up the plane and the block is just on the point of moving down the plane. Find the value of coefficient of friction.
- A block weighing 10 N on a 35° inclined rough plane. If coefficient of friction is 0.25 Calculate the force required to be applied parallel to the plane to make the block slide downward.
- A certain machine has a velocity ratio 20. If the load of 100 N is lifted by an effort of 25 N. Find the mechanical advantage and efficiency of machine
- The following are the observations made on certain machine having VR 40.

Load	N	0	10	25	40	80
Effort	N	2.5	2.8	3.25	3.7	4.9

Find the law of machine by plotting the graph.

Q.6 Attempt any FOUR of the following

16 Marks

- a) Calculate and locate the Centroid of unsymmetrical I section from base having following dimension
 - Top flange: 100 mm x 15 mm.
 - Web : 10 mm x 50 mm
 - Bottom flange : 200 mm x 20 mm
- b) Calculate and locate the Centroid of lamina from base having following dimensions
 - Base width 100 mm
 - Top width 80 mm
 - Height of left vertical side of lamina is 500 mm
 - Right side of lamina is inclined
- c) Calculate and locate the Centroid of inverted T section having flange of size 200 mm x 10 mm and the web of size 15 mm x 100 mm.
- d) Calculate and locate the C. G. of the combination of cylinder of diameter 50 mm and height 250 mm placed axially over hemisphere of diameter 150 mm.
- e) A solid cone of 500 mm height and 200 mm base diameter. The portion above half of its height is removed; locate the point at which remaining body can be balanced.
- f) A solid body formed by joining the base of right circular cone of height 120mm to the equal bases of right circular cylinder of height 30mm. calculate the C.G of the solid from its bottom.

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