P P SAVANI UNIVERSITY

Second Semester of Diploma Studies Examination

June 2022

IDCV1010 Engineering Mechanics

07.06.2022, Tuesday   Time: 10:30 a.m. To 1:00 p.m.   Maximum Marks: 60

Instructions:
1. Make suitable assumptions and draw neat figures wherever required.
2. Use of scientific calculator is allowed.

Q - 1	Answer the Following Questions (Any Five)	[10]
(i)	Convert SI unit into stated units. a) 1000 MPa........N/mm2 b) 109 N.m.......MJ	
(ii)	Differentiate between scalar quantity and vector quantity.	
(iii)	The center of gravity of an equilateral triangle with each side (a) is ...from any one of the three side. (a) $a\sqrt{3}/2$ (b) $a\sqrt{2}/3$ (c) $a/2\sqrt{3}$ (d) $a/3\sqrt{2}$.	
(iv)	The forces passing through a single point are called ___. (Co Planner, Concurrent, Non Concurrent)	
(v)	What will be the value of resultant force for system of forces which is in equilibrium?	
(vi)	Gives the units of the following quantities as per S.I. system. a) Couple b) Power c) Acceleration d) Torque	
(vii)	State the conditions of equilibrium.	
Q - 2 (a)	State and Explain parallelogram law of force.	[05]
Q - 2 (b)	Define couple and its characteristics.	[05]

OR

Q - 2 (a)	Explain principal of superposition & transmibility of forces.	[05]
Q - 2 (b)	Explain composition and resolution of forces.	[05]
Q - 3 (a)	Two equal forces "F" are acting at a point. If resultant of these forces is F/2. Find angle between these forces.	[05]
Q - 3 (b)	Find the resultant force for the system of forces shown in figure. And locate it distance from point A as shown in figure and at what angle it acts.	[05]
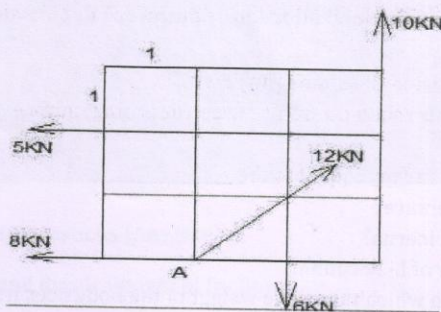
OR

Q - 3 (a)   System of forces is shown in figure. which is in equilibrium. Find the magnitude and   [05]
direction of force that make the system in equilibrium condition with neat sketch.
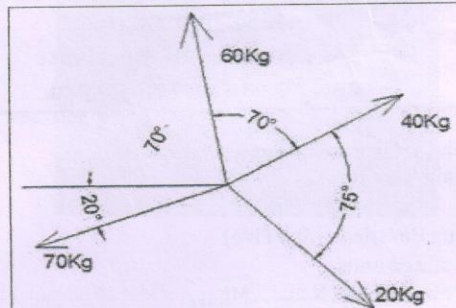
Q - 3 (b)   Following forces are acting at a point.   [05]
(1) 4 KN towards North-West
(2) 2 KN inclined towards 30 · North of east
(3) 3 KN towards East
(4) 5 KN acting towards south
Find magnitude and direction of resultant force.

Q - 4   Attempt any one.   [05]
(i)   The forces 30 N, 40 N, 50 N, 60 N and 70 N are acting at one of the angular points of a
regular hexagon shown in figure, towards the other five angular points, taken in order.
Find the magnitude and direction of the resultant force.
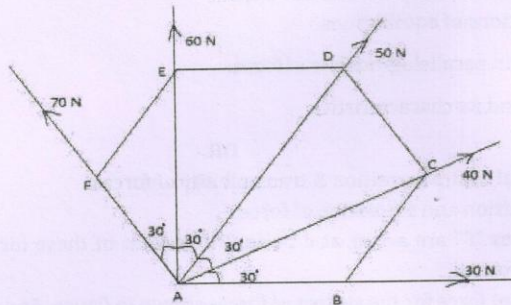
(ii)   The force P is applied to small wheel which rolls on the cable ACB as shown in figure,
Determine the magnitude and direction of the force P if Tension in cable is 800 N.(Wheel
is free to roll).

Q - 5   Answer the Following Questions (Any Five)   [05]
(i)   When there is no relative force between touching surface, which is following force is
developed?
(ii)   Angle of repose is always equql to the _____
(iii)   Define Axis of reference.
(iv)   Define moment of inertia?
(v)   What is symmetry of L- Section?
(vi)   The point, through which the whole weight of the body acts, irrespective of its position, is
known as_____
(vii)   Moment of inertia of a triangular section of base (b) and height (h) about an axis passing
through its C.G. and parallel to the base, is_____

Q - 6 (a)   Define centroid and Centre of gravity?   [05]
Q - 6 (b)   Prove that limiting angle of friction is equal to the angle of repose.   [05]

Q - 6 (a) An I- section has the following dimensions in mm units:
Bottom flange = 300×100
Top flange = 150 × 50
Web= 300×50
Determine mathematically the position of centre of gravity of the section?

Q - 6 (b) A pull of P inclined at 30° to the horizontal is necessary to move a wooden block 250 N weight placed on horizontal table. If coefficient of friction is 0.2. Find pull.

Q - 7 (a) Find the weight of a case if it requires 50.5 N effort to slide it up on the inclined plane making 30° with horizontal plane. Assume coefficient of friction= 0.20.   [05]

Q - 7 (b) Derive the theorem of perpendicular axis?   [05]

OR

Q - 7 (a) An I- section is made of three rectangles as shown in figure. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.   [05]
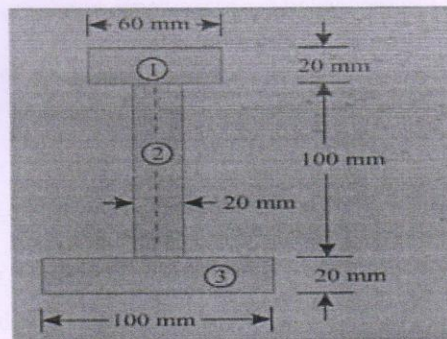
Q - 7 (b) A uniform Lamina shown in figure. Consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm.   [05]
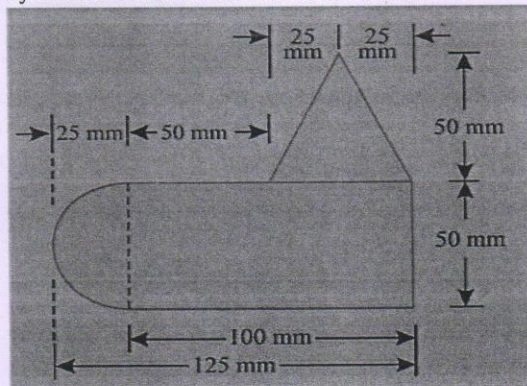
Q - 8 Answer the Following Questions (Any One)   [05]

(a) Explain advantages and disadvantages of friction.

(b) A hollow semicircular section has its outer and inner diameter of 200mm and 120 mm respectively as shown fig.

A ←120 mm→ B

←—— 200 mm ——→

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