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PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

UE15CV101

END SEMESTER ASSESSMENT (ESA) B.TECH. I SEMESTER- Nov. 2015

UE15CV101- ENGINEERING MECHANICS

Time: 3 Hrs | Answer All Questions | Max Marks: 100

1.	a)	State and prove the Varignon's theorem as applied to a concurrent force system.	4
	b)	Two forces are applied to the construction bracket as shown in Fig 1(b). Determine the angle θ which makes the resultant of the two forces vertical. Determine the magnitude R of the resultant.	5
	c)	Explain the term "Moment of a force" with neat sketch.	4
	d)	Determine the x and y-axis intercepts of the line of action of the resultant of the three loads applied to the gearset as shown in Fig 1(d).	7

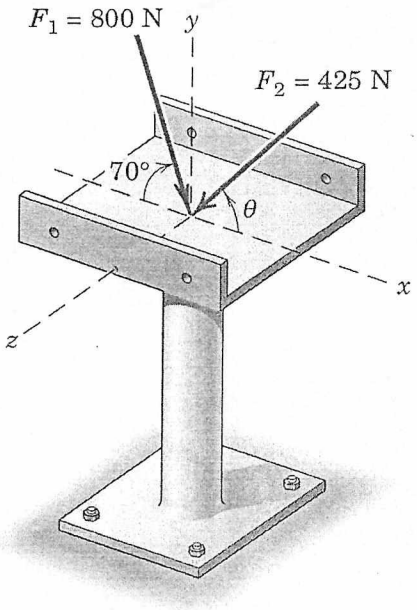

Fig 1(b)

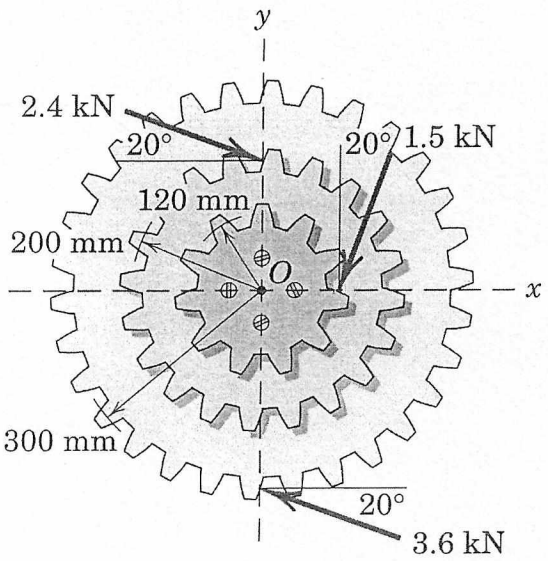

Fig 1(d)

2.	a)	State and explain the conditions of equilibrium required for a system of coplanar non concurrent forces with a neat sketch.	4
	b)	The indicated location of the center of mass of the 1600-kg pickup truck is for the unladen condition. If a load whose center of mass is x=400 mm behind the rear axle is added to the truck, determine the mass m_L for which the normal forces under the front and rear wheels are equal as shown in Fig 2(b).	8
	c)	The portable floor crane in the automotive shop is lifting a 100-kg engine. For the position shown compute the magnitude of the force supported by the pin at C and the oil pressure p against the 80-mm-diameter piston of the hydraulic-cylinder unit AB as shown in Fig 2(c).	8

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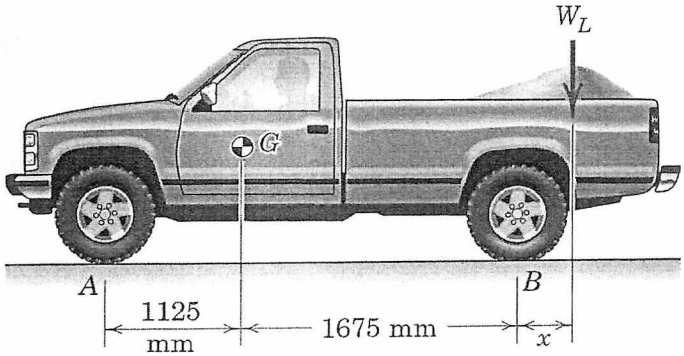

Fig 2(b)

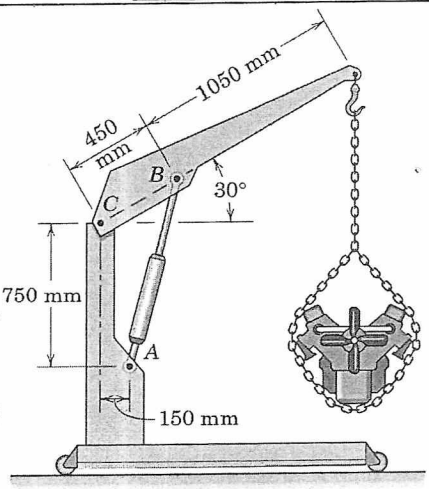

Fig 2(c)

3.	a)	Determine the centroid distance of a triangle of base width, b, and height, h, from its base. Use direct integration method considering the differential element shown in Fig 3(a).	4
	b)	Determine the x- and y- coordinates of the centroid of the shaded area as shown in Fig 3(b)	8
	c)	Determine the moment of inertia of the elliptical area about the y-axis and find the polar radius of gyration about the origin O of the coordinates as shown in Fig 3(c).	8

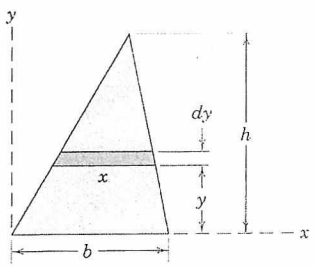

Fig 3(a)

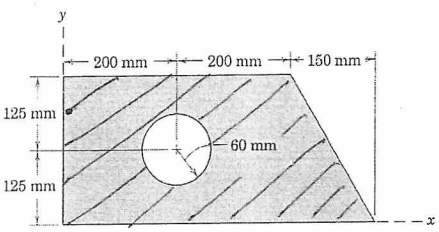

Fig 3(b)

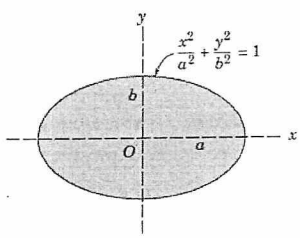

Fig 3(c)

4.	a)	Explain the different types of loadings on the beam.	5
	b)	Determine the force in each member of the loaded truss. Make use of the symmetry of the truss and of the loading as shown in Fig 4(b)	8
	c)	Determine the reactions at A and B for the beam subjected to a combination of distributed and point loads as shown in Fig 4(c)	7

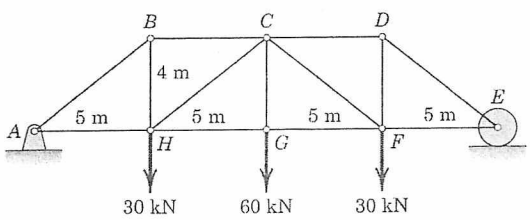

Fig 4(b)

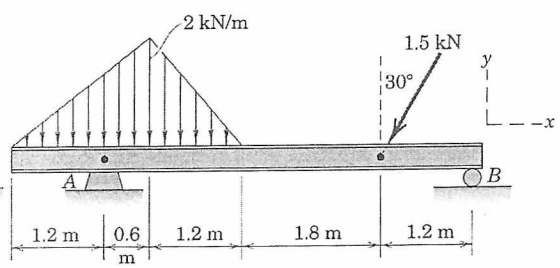

Fig 4(c)

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