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Question Paper Code: 33705

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the principle of transmissibility.

2. Find the magnitude and direction cosines of the resultant of two concurrent forces. $F_1 = 4i + 8j - 8k$ and $F_2 = 5i - 5j + 4K$

3. State the parallelogram law of forces.

4. Define: concurrent and coplanar forces.

5. State varignon's theorem.

6. What is the relationship between area moment of inertia and mass moment of inertia?

7. State work-energy principle for a system of particles.

8. Differentiate kinematics and kinetics.

9. Comment on the nature of friction between two surfaces and the concept of impending motion.
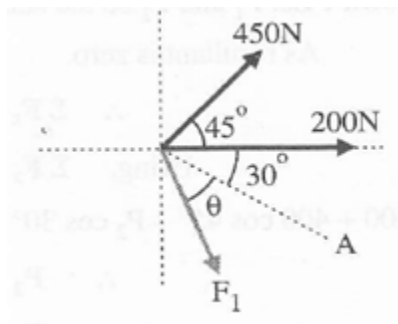
10. Define instantaneous center of rotation.

11. (a) For the system of four forces acting on a body shown in figure, determine the resultant force and its direction. (16)
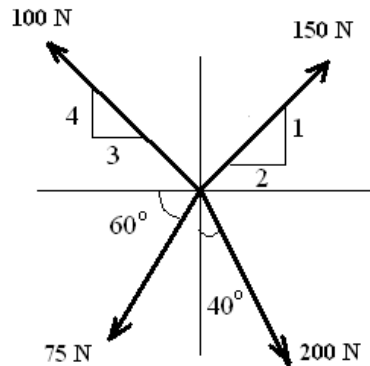

Or

(b) Three forces act as shown in figure. Determine magnitude and direction θ of F, so that resultant is directed along axis A and has magnitude of 1 *kN*. (16)
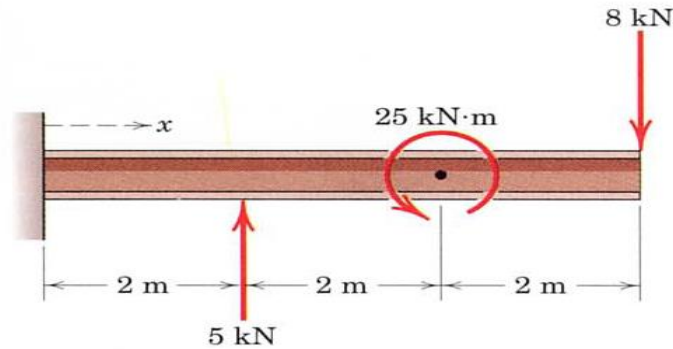

12. (a) A 400 *N* force is applied to the welded slender bar at an angle of $\theta = 20°$ (Figure). Determine the equivalent force-couple system acting on the weld at (i) point *A* and (ii) point *O*. For what value of θ would the results of part (i) and (ii be identical. (16)
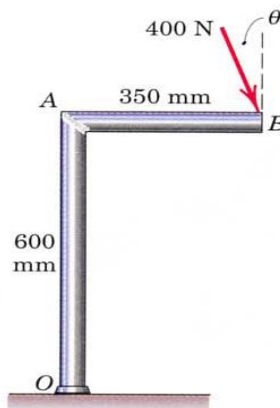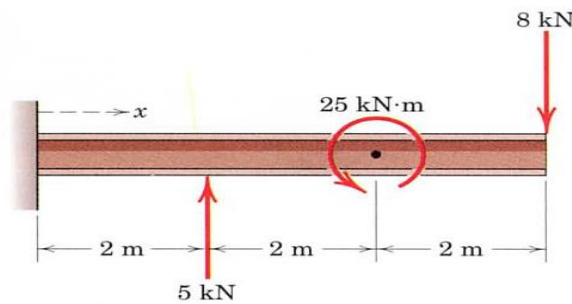
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Or

(b) Determine and locate the resultant R of the two forces and one couple acting on the I-beam shown in Figure. (16)

13. (a) Derive an expression for mass moment of inertia of prism along three axes. (16)

Or

(b) Determine and locate the resultant R of the two forces and one couple acting on the I beam shown in figure. (16)


14. (a) A bullet of mass 25 gram is moving with a velocity of 500 m/s and fired into a body of 12 kg, which is suspended by a string, fixed at top, 1 m long. The bullet gets embedded into the body and the unit (ie, bullet + body) swings through some angle. Find out the angle through which the unit swings. (16)

Or

(b) A particle under constant decelaration is moving in a straight line and covers a distance of 20 meters in the first 2 seconds and 40 meters in the next 5 seconds. Calculate the distance it covers in the subsequent 3 seconds and the total distance travelled by the particle before it comes to rest. (16)

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15. (a) Block A of mass 12 kg and block B of mass 6 kg are connected by a string passing over a smooth pulley. If $\mu = 0.12$ at all surfaces of contact find smallest value of force P to maintain equilibrium. Refer figure. (16)
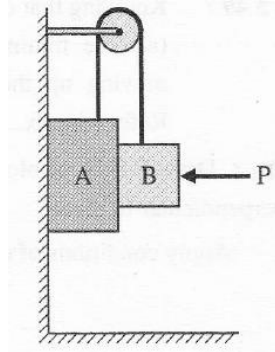
Or

(b) Figure shows a four-bar mechanism. If the crank O_1A rotates with an angular velocity of 150 rpm in the clockwise direction, determine the angular velocities of links AB and O_2B for the position. (16)

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