B.Tech I Year (R09) Supplementary Examinations June 2016

ENGINEERING MECHANICS
(Common to AE, BT, CE, ME \& MCTE)
Time: 3 hours
Max. Marks: 70
Answer any FIVE questions
All questions carry equal marks
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1 A moment of 24 N m is required to turn the bolt about the axis [shown in figure below]. Determine the force F . If the wrench fits easily on the bolt, find the reactions at two corners P and Q of the bolt.


2 Determine the forces in each member of the frame and state if the member are in tension or compression. Set $P_{1}=2 K N, P_{2}=4 K N$


3 One end of Beam B of uniform section weighting 1400 N is hinged and tine other lifted by a $15^{\circ}$ wedge . The lower face of wedge .A is horizantal and is resting on horizantal support. The coefficient of friction is 0.36 at the upper surface of the wedge and 0.25 at the lower surface. Find the horizontal force P required to push the wedge under the beam.


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4 Locate the center of gravity of the right circular cone about the axis of rotation of base radius ' $r$ ' and height ' h ' as shown in the below figure.


5 Determine the mass moment of inertia of a thin equilateral triangular plate of mass ' m ' and thickness ' t ' about the axis perpendicular to the plane of the plate and passing through the centre of the mass. Base width is ' $b$ ' and height of vortex above base $=$ ' $h$ '. Density of material is ' $w$ '.

6 (a) A train is uniformly accelerated and passes successive kilometer stones with velocities of 18 kmph and 36 kmph respectively. Calculate the velocity when it passes the third kilometer station. Also find the time taken for each of the two intervals of one kilometer.
(b) A homogeneous sphere of radius of $\mathrm{a}=100 \mathrm{~mm}$ and weight $\mathrm{W}=10 \mathrm{~N}$ Can rotate freely about a diameter. If it starts from rest and gains with constant angular acceleration, angular speed $\mathrm{N}=180 \mathrm{rpm}$, in12 revolutions, find the action moment.

A flexible chain of total length ' $L$ ' resting on a smooth table with a hanging length $h$, is shown in figure below. The chain originally at rest is released. If the chain weighs ' $w$ ' $N$ per unit length, describe its motion.


In a mechanism, a cross-head moves in straight guide with simple harmonic motion. At distances of 125 mm and 200 mm from its mean position, it has velocities of $6 \mathrm{~m} / \mathrm{sec}$. and $3 \mathrm{~m} / \mathrm{sec}$. respectively. Find the amplitude, maximum velocity and period of vibration. If the Cross-head weighs 2 N , Calculate the maximum force on it in the direction of motion.

