Roll No. $\square$ Total No. of Pages : 02
Total No. of Questions: 09
B.Tech.(Automation \& Robotics) (2011 \& Onwards) (Sem.-3)

ENGINEERING MECHANICS
Subject Code: BTAR-303
Paper ID : [A0132]
Time : 3 Hrs.
Max. Marks : 60

## INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## SECTION-A

1. Answer briefly :
a) Define Coplanar Forces.
b) State Lami's theorem.
c) How will you distinguish between static friction and dynamic friction?
d) State D'Alembert's Principlé.
e) State conservation of moment of momentum.
f) What is translation of moving frames?
g) What is rectangular motion of point?
h) Name different force systems.
i) Name different operations applied on vectors.
j) Distinguish clearly between a 'simple wheel and axle'.

## SECTION-B

2. Describe the working of a Weston's differential pulley block.
3. In a differential screw jack, the screw threads have pitch of 10 mm and 7 mm . If the efficiency of the machine is $28 \%$, find the effort required at the end of an arm 360 mm long to lift a load of 5 kN .
4. A string ABCD , attached to fixed points A and D has two equal weights of 1000 N attached to it at B and C . The weights rest with the portions AB and CD inclined at angles as


Find the tensions in the portions $\mathrm{AB}, \mathrm{BC}$ and CD of the string, if the inclination of the portion BC with the vertical is $120^{\circ}$.
5. A stone is dropped gently from the top of a tower. During its last one second of motion it falls through $64 \%$ of the height. Find the height of the tower.
6. State and derive Moment of Momentum Equation.

## SECTION-C

7. What is pulley? State the working of first system, and second system of pulleys. Derive relations for their respective velocity ratios.
8. Derive an equation for the velocity ratio of a worm and worm wheel when it is (a) single threaded and (b) double threaded.
9. A force given by :

$$
\mathrm{F}=3 \mathrm{r}^{2} \mathrm{i}+5 \mathrm{tj}-\left(8 \mathrm{r}^{3}+400\right) \mathrm{kN}
$$

Acts from $\mathfrak{t}=0$ to $\mathrm{t}=10 \mathrm{~s}$. Determine the impulse of the force. If this impulse acted at the centre of mass of a body of mass 500 kg and brought it to rest, estimate the velocity of the body before it acted.

