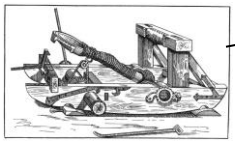


NAME:_____ Roll No:_____ Group:_____

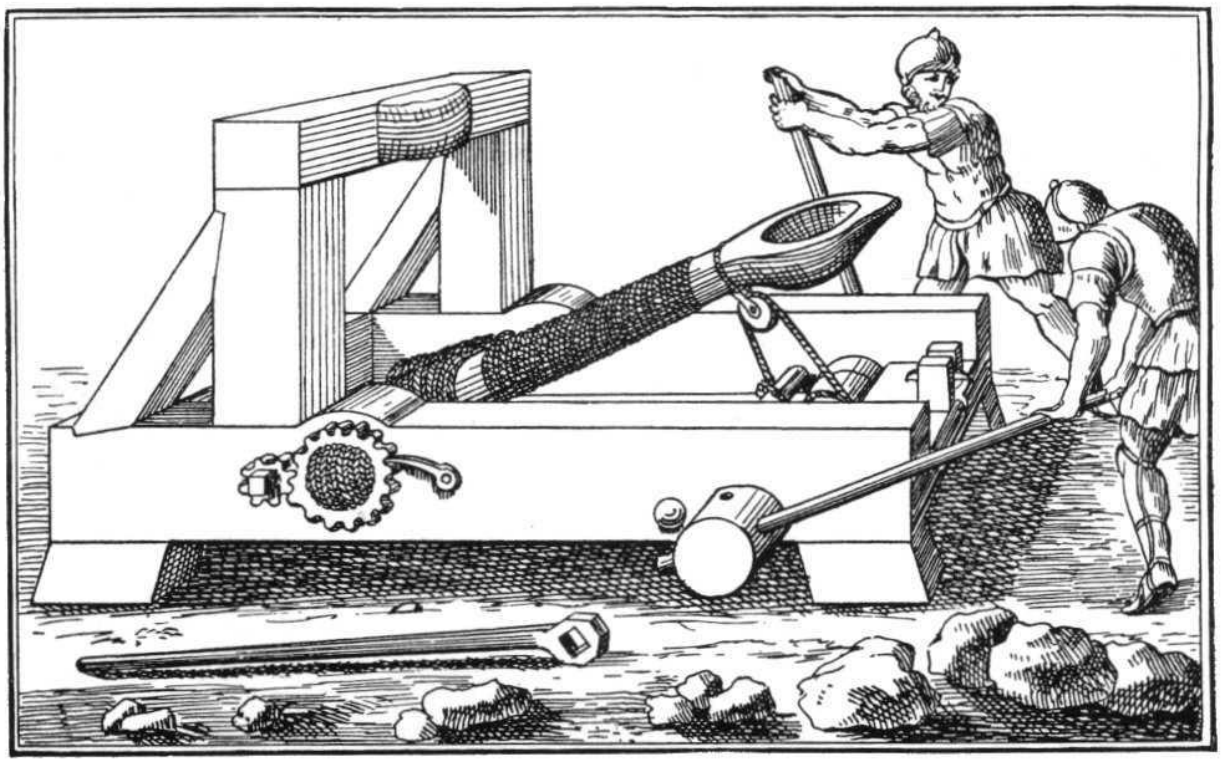
This submission is original work and no part is plagiarized (signed) _____(Date)_____

Thapar Institute of Engineering and Technology, Patiala

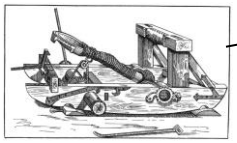
MECHANICAL ENGINEERING DEPARTMENT

ASSIGNMENT - 2.
DYNAMICS FOR THE MANGONEL -WITH DRAG

UTA013 Engineering Design Project-I



(Reference: TCD course 1E13



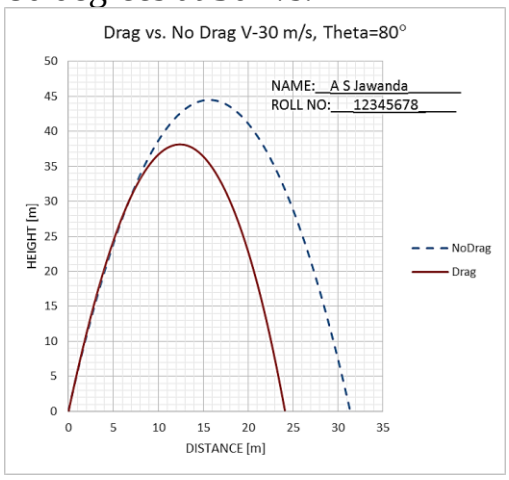
NAME:_____ Roll No:_____ Group:_____

ASSIGNMENT - 2.
DYNAMICS FOR THE MANGONEL-WITH DRAG

The following tasks have been based on the lecture on projectile dynamics for the Mangonel -**With Drag**. Complete the following **individually, copying will be dealt with severely.**

Notes:

1. Ensure the curves are visible and sufficient resolution is provided so that the height and distance is determinable. Keep scale of x-axis and y-axis roughly the same, e.g. 10m on x-axis and y-axis should be forming a square. The following chart is an example for 80 degrees at 30m/s.



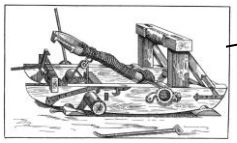
Note:
Compulsory to Add Text box of Name and Roll No to every graph as shown.

2. The excel graphs for Drag Vs No Drag Velocity=30m/s, Angle=80 degrees have to be shown for evaluation on the same day. While the print of this word document with **graphs (with Name and Roll No in text box)** and **hand written conclusions, name & roll number on every page** , stapled together, is to be submitted in next Tutorial class (if it is a holiday, then as instructed).
3. Do not leave this assignment until the last minute to find you have some IT issue.

Enjoy the assignment and try to think around the subject as much as possible and take from it any tips that you might use with your own Mangonel design.

Marking Scheme:
Tutorial 2 Total = 10 Marks
Evaluation at end of 2 Hours Tutorial 2: 5 Marks (Drag Vs No Drag. Velocity=30m/s, Angle=80 degrees)
Evaluation of printout and hand written submission: 5 Marks

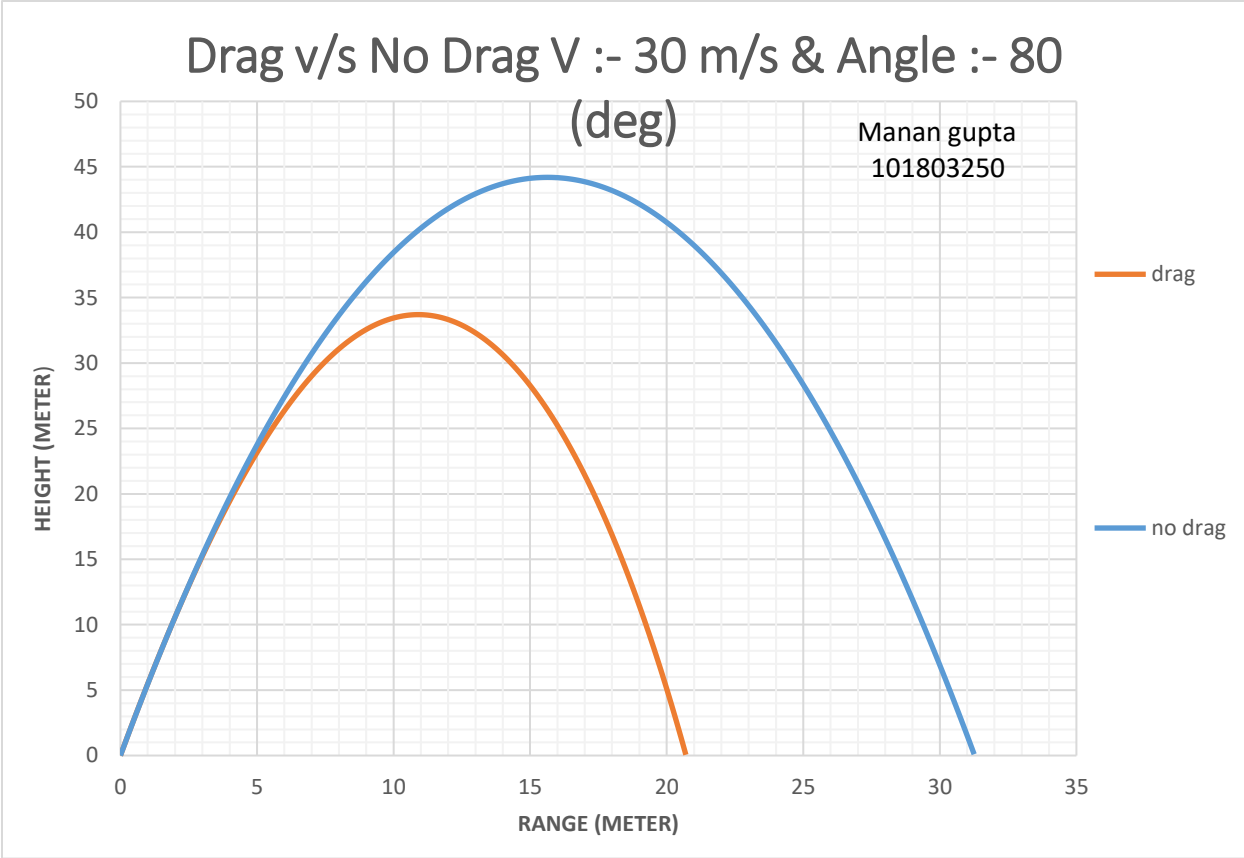
TUTORIAL CLASS EVALUATION **[5 Marks]**

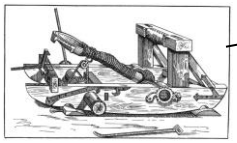


NAME:_____ Roll No:_____ Group:_____

Plot graph for Drag Vs No Drag. Velocity=30m/s, Angle=80 degrees.
Use rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m.

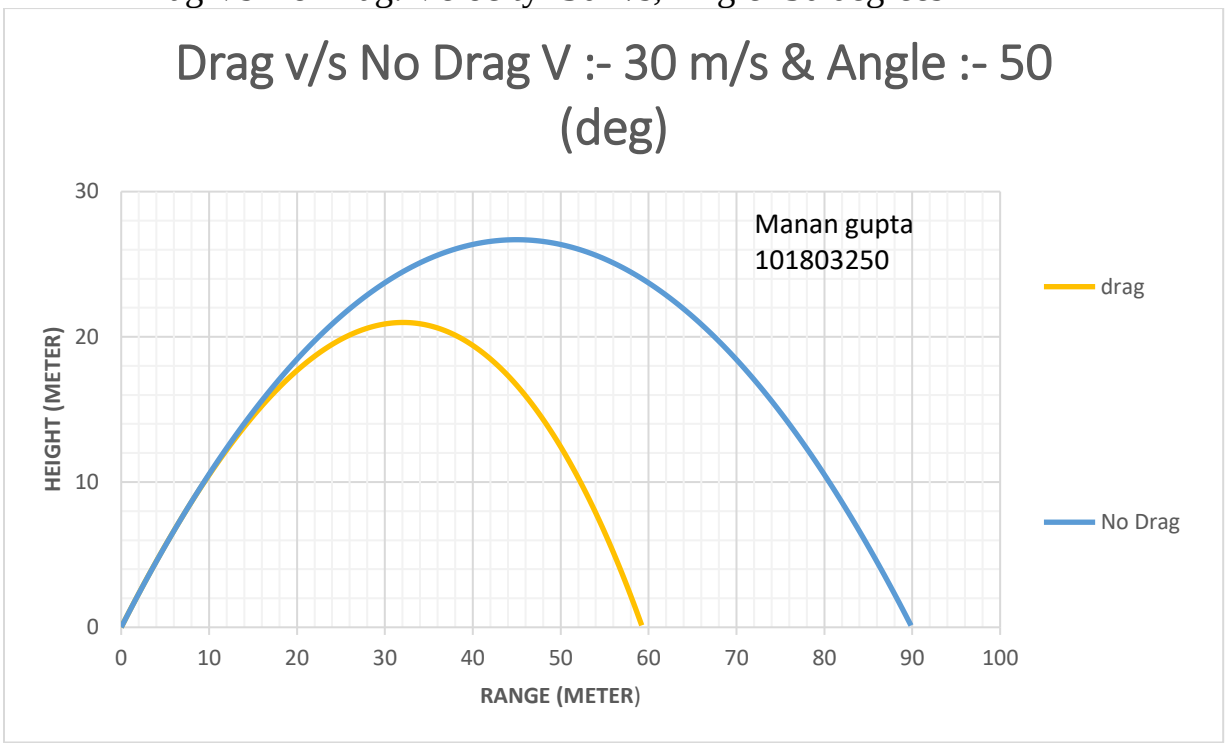
Q1. Use rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m.
Drag Vs No Drag. Velocity=30m/s, Angle=80 degrees



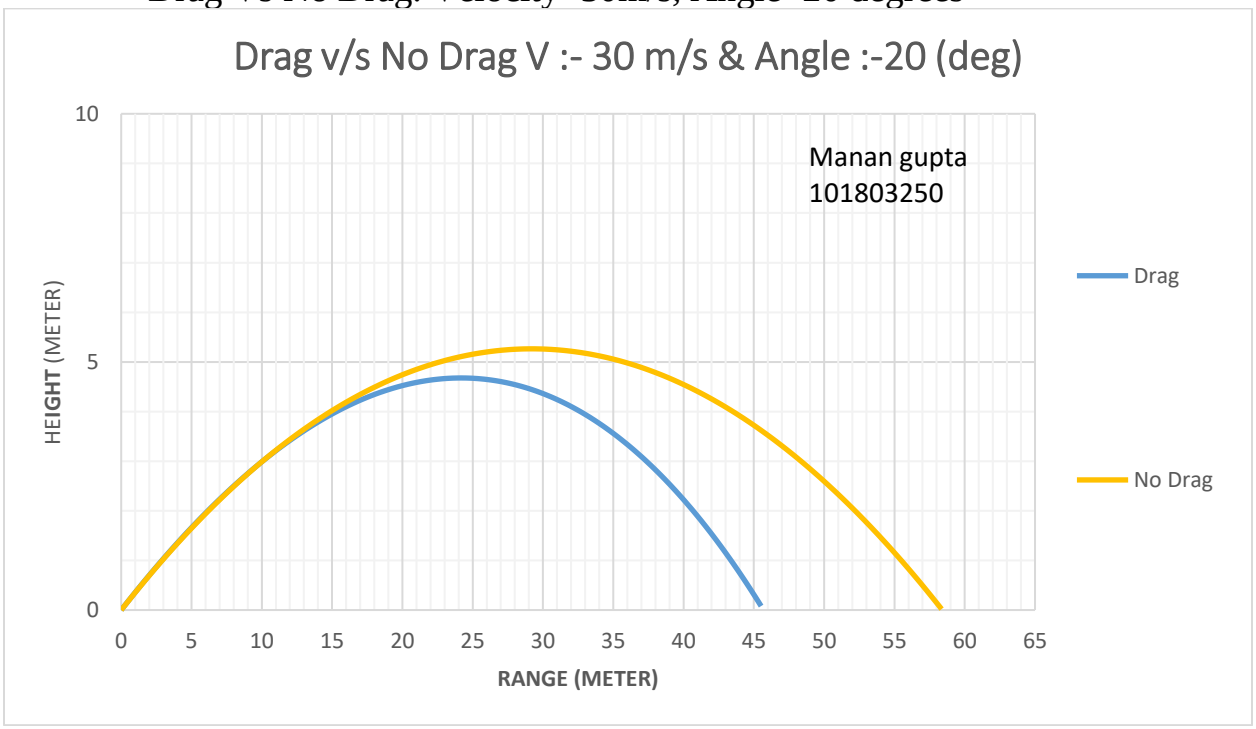


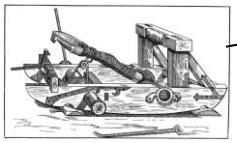
NAME:_____ Roll No:_____ Group:_____

Drag Vs No Drag. Velocity=30m/s, Angle=50 degrees



Drag Vs No Drag. Velocity=30m/s, Angle=20 degrees





NAME:_____ Roll No:_____ Group:_____

Q1 or directly from the results calculated using your spreadsheets, the predicted max. horizontal distances travelled (in the x-direction when y = 0 approx.) for the "drag" and "no-drag" cases. Complete the following table with **hand written values**. Round your results to nearest integer (no decimal places).

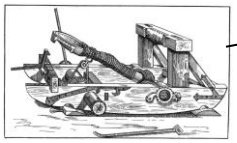
	20 Degrees	45 Degrees	70 Degrees
x (with drag) [m]			
x (no drag) [m]			

Q2. Complete the following table by **hand written values** for the maximum distance travelled in x. Use values rho=1.2 kg/m^3, mass=0.05kg, D=0.045m, theta=45degrees in this question.

Cd \ Velocity	10m/s	20m/s	40m/s
0			
0.5			
1.0			

Q3. Complete the following table by **hand written values** for the maximum distance travelled in x. Use values rho=1.2 kg/m^3, Cd=0.4, D=0.045m, Theta=45degrees in this question.

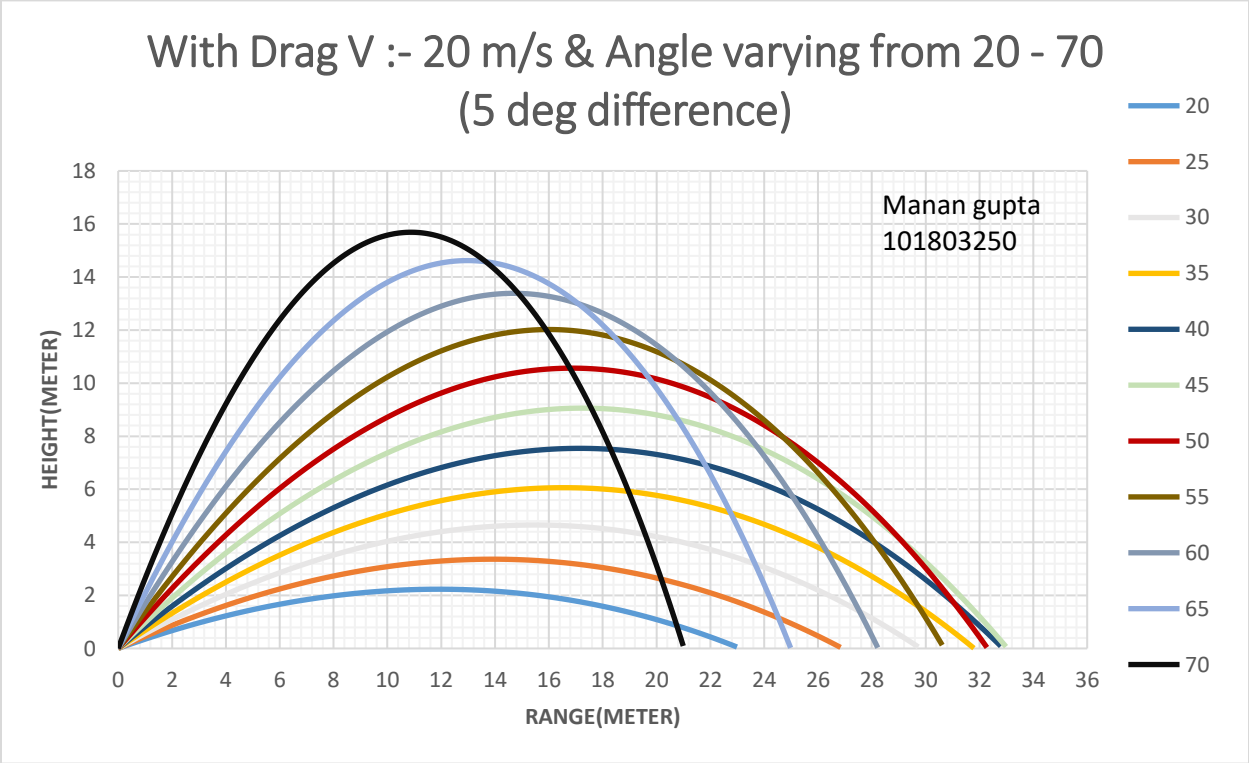
mass \ Velocity	10m/s	20m/s	40m/s
0.010 [kg]			
0.050 [kg]			
0.100 [kg]			



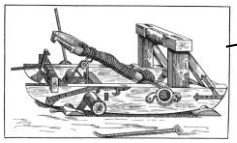
NAME:_____ Roll No:_____ Group:_____

Q4. For a 20m/s launch velocity, taking the values rho=1.2 kg/m^3, Cd=0.4, mass=0.05kg, D=0.045 m find the maximum horizontal distance of travel for launch angle varying from 20 to 65 degrees and record **hand written values** in table below. Plot the graph and use it to find the angle of launch which would give maximum horizontal distance of travel.

Velocity	Max. Distance in x
20°	
25°	
30°	
35°	
40°	
45°	
50°	
55°	
60°	
65°	
70°	



(Reference: TCD course 1E13



NAME:_____ Roll No:_____ Group:_____

NOTE: Answers to Q6, Q7, Q8, Q9 and Q10 to be **hand written only**

[5 Marks]

Q5. From the results of question 2, write one or two sentences to address each of the following:

a) Observations: _____

_____

b) Explanations: _____

_____

c) Recommendations with regards to the optimum use of the Mangonel:

_____

_____

Q6. If we were to test the mangonel outside in windy conditions, what comments have you to add based on the above analysis in question 6.

_____

_____

Q7. From the results of question 3, write one or two sentences to address each of the following;

a) Observations: _____

_____

b) Explanations: _____

_____

c) Recommendations with regards to the optimum use of the Mangonel:

_____

_____

Q8. From the results of question 4, write one or two sentences to address each of the following;

a) Observations: _____

_____

b) Explanations: _____

_____

c) Recommendations with regards to the optimum use of the Mangonel. For this last point, consider the effect of a change in mass when all other aerodynamic and physical parameters remain fixed, e.g. the potential energy stored in the "spring":_____

_____

Q9. From question 5 angle of launch which would give maximum horizontal distance of travel is: _____