

**MID TERM EXAMINATION**  
**B.TECH PROGRAMMES (UNDER THE AEGIS OF USICT)**  
 2nd Semester, May 2023

Paper Code: ES 114  
 Time: 1.5 Hrs.

Subject: Engineering Mechanics  
 Max. Marks: 30

Note: Attempt Q. No. 1 which is compulsory and any two more questions from remaining.

Q. No.	Question	Max. Marks	CO(s)
1	Write short notes on the following: a) State Lami's theorem. b) Perfect Truss assumptions c) State Varignon's theorem. d) What is a self-locking machine?	10	
2	Derive the expression for the ratio of tensions for a flat belt passing over a pulley when it is just on the point of slipping.	10	CO2
3	Determine the force in GH, GD and GF member of truss as shown. <div style="text-align: center;"> </div>	10	CO2
4	Find the centroid of given shaded area as shown in figure. <div style="text-align: center;"> </div>	10	CO1



## Class Test

B.Tech- 2<sup>nd</sup> semester  
Paper code: ES-114  
Time: 1hr: 30 mins.

June 2023  
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**Note: - Attempt Q. No.1 is compulsory. Attempt any two more questions from the rest.**

Q1. Write short notes:

- (a) Classify collision of elastic bodies. (2)
- (b) Explain the location of the Instantaneous Centre. (2)
- (c) Define D'Alembert's principle. (2)
- (d) Explain the types of load and beam. (2)
- (e) Define the difference between the kinematic and kinetic of the particles. (2)

Q2. (a) From what height must a heavy elastic ball be dropped on a floor so that after rebounding thrice, it will reach a height of 10 m?  
Take the coefficient of restitution  $e = (0.5)^{0.9}$  (5)

(b) A bar AB rests at the edge of a wall of some point C with its end A resting on a horizontal floor as shown in Fig.1 If the end A moves with a constant velocity  $V_a$ , setup an expression for the angular velocity of the bar in terms of  $h$  and  $\theta$ . Proceed to calculate the angular velocity if  $V_a = 2.5 \text{ m/s}$ ;  $h = 4 \text{ m}$  and  $\theta = 30^\circ$ . (5)

Q3. (a) A particle moves with uniform acceleration along a straight line ABC. The speeds of the particles at positions A and C are  $5 \text{ m/s}$  and  $25 \text{ m/s}$  respectively as shown in Fig 2. If point B lies midway between A and C, what will be the ratio of time taken by the particle to travel distances AB and BC? (5)

(b). Draw the space diagram of a given beam as shown in Fig.3 (5)

Q4. (a) Determine the reaction at Points A and B as shown in Fig 4. (5)

(b) A ball impinges directly on a similar ball at rest. Due to impact, the first ball comes to rest, and half of the initial kinetic energy gets lost. Determine the coefficient of restitution. (5)

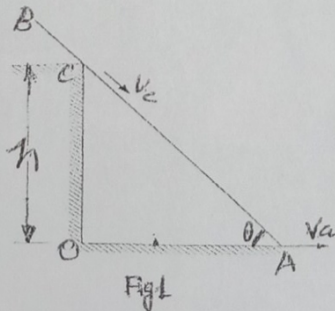


Fig.1

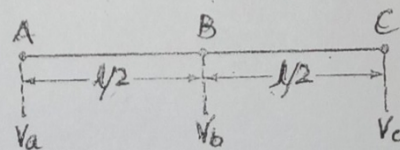


Fig. 2

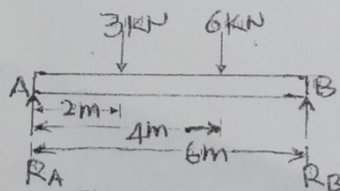


Fig.3

Fig(3)

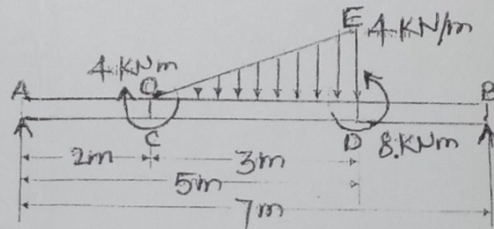


Fig.4

Fig(4)

AB = 7m  
CD = 3m  
At C = 4 kNm } Couple  
At D = 8 kNm } Force