

College of Engineering, Pune
END SEMESTER EXAM 2010-11
FYBTECH

CE 101 Engineering Mechanics

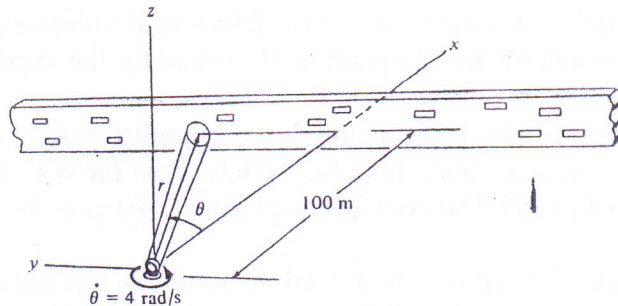
Day & Date- Thursday 16/11 /2010
 Timing- 10.00am- 1.00 pm

Max. Marks- 50
 Duration – 3 Hrs.

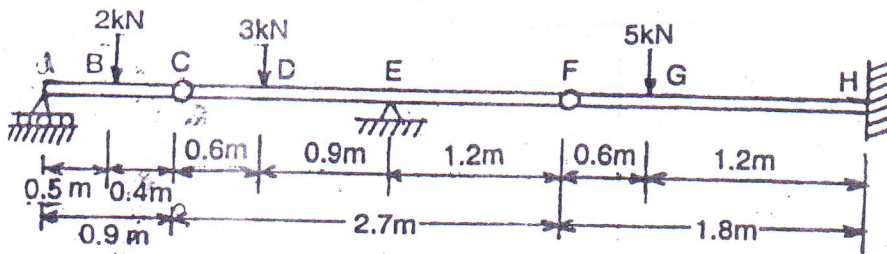
Instructions:

1. All questions are compulsory
2. Use of non-programmable calculator is allowed
3. Mobile phones are strictly prohibited in the Exam Room
4. Assume suitable data if necessary

- Q1. The searchlight shown in the fig casts a spot of light along the face of a vertical wall that is located 100 m from the searchlight. Determine the magnitudes of the velocity and acceleration at which the spot appears to travel across the wall at the instant $\Theta = 45^\circ$. The search light is rotating about the z axis at a constant rate of $\dot{\Theta} = 4 \text{ rad/s}$
- (8)



- Q2. For the beam supported and loaded as shown in the fig determine separately the force and couple representing the reaction at H using virtual work method.
- (7)



- Q.3A) Two guns having same muzzle velocity of 320 m/sec fired simultaneously at angle θ_1 and θ_2 respectively for same target which is at a distance of 4000 m. Calculate the time difference between the hits. (03)
- B) A hammer head weighing 70 N is arranged to swing downwards in a circular path. It is released at a point 1.2m higher than the lowest point of the circle. Find the kinetic energy and the speed of hammer head at the lowest point. If at that point it breaks a piece of metal and consumes energy equal to 42 Nm of the total energy, to what height will it rise on the other side? (04)
- Q4. The length of connecting rod and crank in a reciprocating pump are 1500 mm and 300 mm respectively. The crank is rotating at 500 rpm. Find the velocity with which piston will move, when the crank has turned through an angle of 35 degree from line joining centre of piston and crank end. (07)
- Q5.A) A car has a natural frequency of 3.5 Hz without passengers and 3.25 Hz with passengers. If the mass of the car is (1.2×10^3) kg, determine the stiffness of the car and the mass of the passengers. (02)
- B) Define with a neat sketch the following w.r.t. simple harmonic motion. (03)
- Amplitude of vibration
 - Frequency of oscillation
 - Phase angle.
- C) Draw the model of a single rotor on a fixed shaft subjected to torsional vibration (SDOF) system and obtain an equation of motion for the same. (03)
- Q.6 A car weighing 2500 kg is travelling down a sloping road (1 in 10) at a speed of 30 kmph. If the brakes suddenly jam the vehicle, how far will the tyres of the car skid before coming to rest? The coefficient of kinetic friction between road and tyres is 0.5 (6)
- Q.7 A crate weighing 300 kg is to be pulled on a railway platform by a child using a rod connected at the centre of the crate at an angle of 45 degrees. If a child applies a pulling force of 600 N, what will be the velocity of the crate after 5 seconds. Assume coefficient of kinetic friction between the crate and the concrete platform to be 0.4 (7)