Government College of Engineering, Aurangabad

(An Autonomous Institute of Government of Maharashtra)

F.E.(ETC/CSE/IT) Examination

End Semester Examination- Winter 2016

AM-113: Engineering Mechanics

Time: Three hours 2 DEC 2016 Max. Marks: 70

"Verify the course code and check whether you have got the correct question paper."

N.B.:-

1. ***Any one question from Q.3 and Q.4, and All other questions are compulsory.***
2. ***Figures to the right indicate full marks.***
3. ***Assume suitable data if necessary and state it clearly.***
4. ***Use of non-programmable calculator is allowed.***

Q1.a) Write any three. **(6)**

i) Write basic differential equations of motion.

ii) State law of conservation of momentum.

iii) State principle of transmissibility of force with explanation.

iv) Define free body diagram with two examples.

v) What do you understand by dynamic equilibrium?

b) Write any two: **(8)**

i). Derive the relation between work and energy for angular motion.

ii) State laws of dry friction.

iii) Explain the concept of two force body in equilibrium.

iv) State and prove parallel axis theorem and define radius of gyration.

Q2. Attempt any two. **(14)**

a) Find the resultant of the force system shown in Fig.1.

b) A force F= 2000 N is passing from point A(3,4,5) towards point B(-7,-,-2). Find out the moment of force about line CD where co-ordinates of points C and D are (2,1,1) and (4,-2,3) respectively.

c) Determine the reactions of the beam shown in Fig.2 by using virtual work method

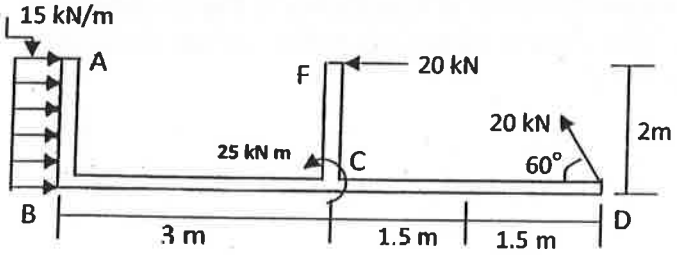

Fig.1 (Q.2a)

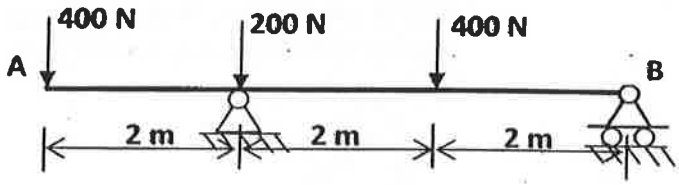

Fig.2 (Q.3c)

Q3. a) Determine the reactions at the supports of the compound beam shown in Fig.3. **(7)**

b) Blocks A and B weigh 100 N and 300 N respectively and cord is parallel to the incline. If the coefficient of the friction for all surfaces in contacts is, $\mu = 0.5$, at what inclination will the block B start sliding and what will be the tension in the cord (Fig.4) ? **(7)**

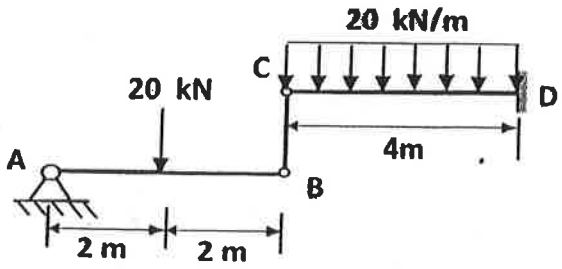

Fig.3 (Q.3a)

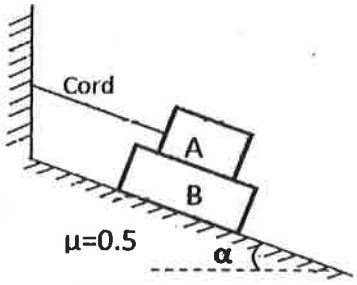

Fig.4 (Q.3b)

OR

Q4. a) Find out the centroid of the shaded area shown in Fig.5. **(5)**

b) Determine the M.I of the shaded area shown in Fig.5 about its centroidal X-Y axes **(9)**

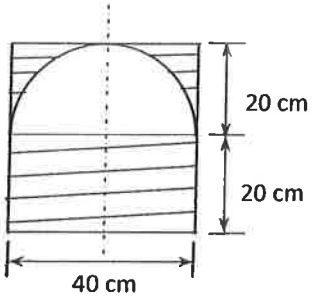

Fig.5(Q.4a & b)

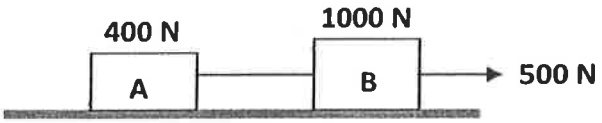

Fig.6 (Q.6a)

Q5. Attempt any two. **(14)**

a) A particle is dropped from the top of the tower 100 m high. Another particle is projected upwards at the same time from the foot of the tower, and meets the first particle at a height of 30m. Find the velocity with which the second particle is projected upwards.

b) A fireman holding a nozzle at a distance of 6 m from a vertical wall wishes to send a jet through a small window in the wall located 5m above the nozzle. If the inclination of the jet with horizontal is 60° at the nozzle, calculate the required initial velocity of the jet.

c) A bus starts from rest on a curve of 300 m radius and accelerate at the constant rate $a_t = 0.75\ m/s^2$. Determine the distance and time that the bus will travel before the magnitude of its total acceleration is $0.9\ m/s^2$.

Q6. **a)** Determine the accelerations of the blocks and the tension in the string of the system shown in Fig.6 using Newton's second law of motion. The coefficient of friction under the blocks, $\mu_k = 0.30$. **(7)**

b) If the block of weight 1000 N is released from rest at A as shown in Fig.7, determine (i) the speed of the block at B and (ii) the distance that block travels on the horizontal surface before coming to rest at C. $\mu_k = 0.25$. **(7)**

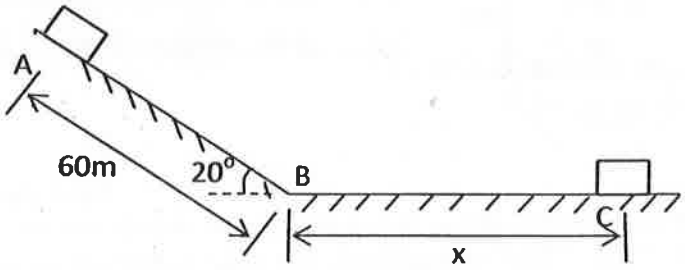

Fig.7 (Q.6b)