



Sanjay Ghodawat University, Kolhapur

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

FY B Tech

FYT 104

6 Nov 2017
DEC

School of Technology

Engineering Mechanics

End Semester Examination (ESE)

2017-18

Semester I

Max Marks: 100

Time: 3 Hrs

- Instructions for Students:**
- 1) Use of non-programmable calculator is allowed
 - 2) All questions are compulsory
 - 3) Figure to the right indicates **full marks**
 - 4) Draw **neat sketches** wherever necessary

Q.1 a State and explain

1. Law of Parallelogram of forces
2. Principle of transmissibility

b A boat is moved uniformly along a canal by two horses pulling with force $P = 890\text{N}$ and $Q = 1068\text{N}$ acting at an angle $\alpha = 60^\circ$ as shown in fig.1a. Determine magnitude of the resultant pull on the boat and the angle β and γ

OR

c A tower guy wire is anchored by means of a bolt at A shown in fig.1b. The tension in the wire is 3000 N . Determine the components of force F_x , F_y , F_z and the angle θ_x , θ_y and θ_z direction of force.

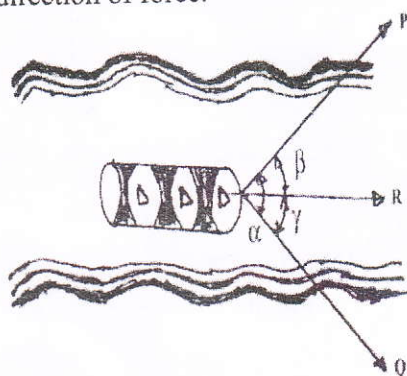


Fig.1a

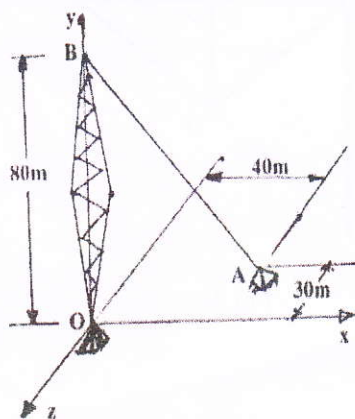


Fig.1b

Q2 a State and explain

1. active forces, reactive forces
2. Free body diagram with suitable example.

b Rectangular plate of negligible weight is held horizontally by four wires of equal length at A, B, C, and D as shown in fig 2a. A point

Marks
06 COs
CO1

10 CO1

10 CO1

06 CO2

10 CO2

load of 16 kN acts on the plate at 150mm from AB and 200 mm from AD. If the minimum force in any of the wires is 2.2 kN, Find forces in remaining wires.

OR

- c Determine the x coordinates of the centroid with respect to the origin O of the shaded area as shown in Fig. 2b

10 CO2

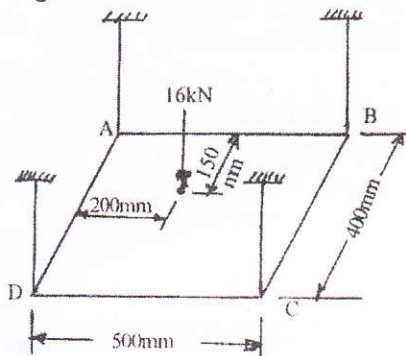


Fig.2a

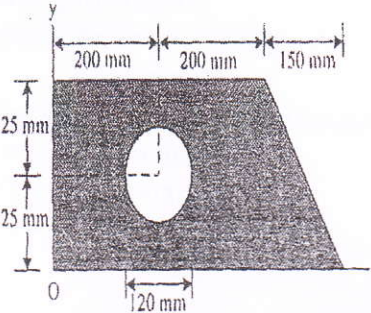


Fig.2b

- Q3 a Determine the forces in each member of the truss shown in Fig. 3a. also state if the members are in tension or compression.
b ACE and BCD are the two rigid rods connected by string FG and a pin at C as shown in fig.3b. Find the reaction at A and B, the force on the pin C and the tension in the string FG.

09 CO3

09 CO3

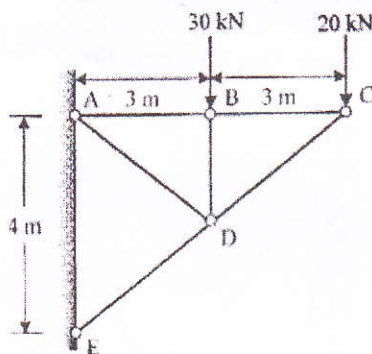


Fig.3a

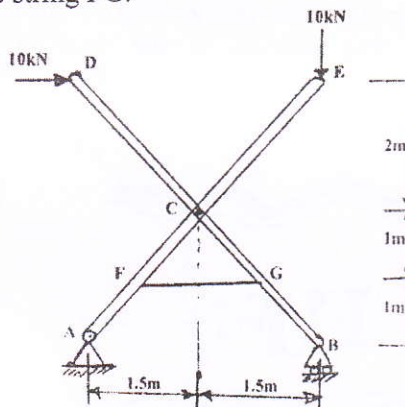


Fig.3b

- Q4 a Explain the term
1. Dependent motion 2. Relative Motion
b During a race the dirt bike was observed to leap up off the small hill at A at an angle of 60° with the horizontal as shown in Fig. 4a. If the point of landing is 6 m away, determine the approximate speed at which the bike was travelling just before it left the

06 CO4

10 CO4

ground.

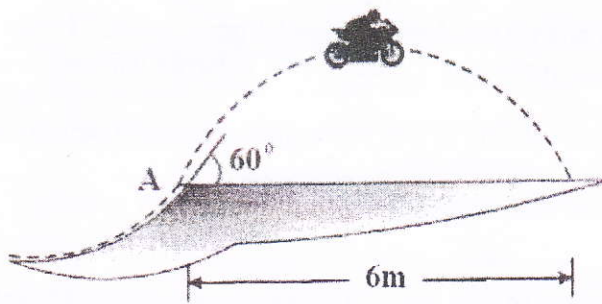


Fig.4a

- Q5 a Explain the following term 08 CO5
 1. Kepler's law of planetary motion
 2. Dynamic Equilibrium

- b A shunting engine with two bogies is moving on the straight level track. The mass of engine is 15000 kg and that of the each bogie is 10000 kg. The frictional resistant to motion is 1kN for the engine and 0.75 kN for each bogie. If the acceleration is 2 m/s^2 , determine the tractive force exerted by the engine and tension in the two connecting couplings. 10 CO5

OR

- c Package is projected up a 15° incline at A with an initial velocity of 8 m/s shown in fig. 5a. Knowing that the coefficient of kinetic friction between the package and the incline is 0.12, determine (a) the maximum distance d that the package will move up the incline, (b) the velocity of the package as it returns to its original position. 10 CO5

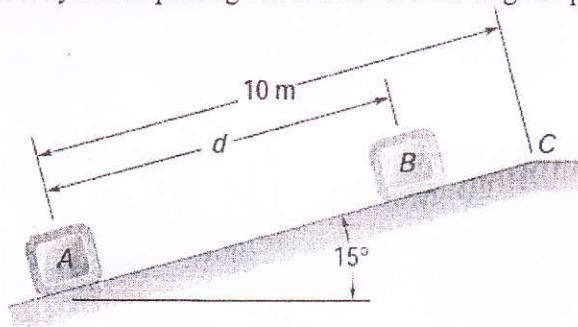


Fig.5a

- Q6 a) Prove that coefficient of restitution $e = 1$ for perfectly elastic material. 06 CO6
 b) A bullet of mass 100 gm is fired in to a freely suspended Body in a rest of mass 10 kg. Due to the impact, the bullet gets embedded in to the body and body with bullet move with velocity 7 m/s . Find velocity of bullet before impact and loss of kinetic energy. 10 CO6

OR

- c A hand ball of mass 0.050 kg is dropped from a height $H = 2\text{m}$. The coefficient of restitution for the impact between ball and floor is 0.75. 10 CO6

- a) Determine velocity of ball at the instant before it strikes the floor
- b) Determine velocity of ball at the instant after it rebound.
