



Sanjay Ghodawat University, Kolhapur

2017-18

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

FY B Tech

School of Technology

Semester I

FYT 104

Engineering Mechanics

Max Marks: 100

~~Nov~~ 2017, 27 Dec

End Semester Examination (ESE) (Re)

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

- | | | Marks | COs |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|
| Q.1 | a) Explain in details Force and Force system | 04 | CO1 |
| | b) Find the magnitude of the resultant and its location of the following forces acting at a point 'O' as shown in Fig.1a. | 07 | CO1 |
| | c) Three cables are used to tether a balloon as shown in fig. 1b. Knowing that the balloon exerts an 800-N vertical force at A, determine the tension in each cable. | 07 | CO1 |

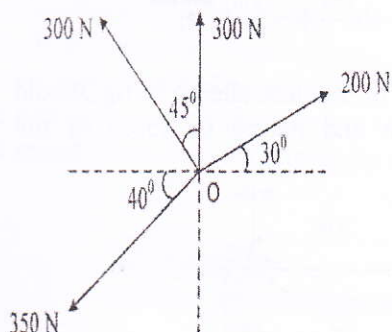


Fig.1a

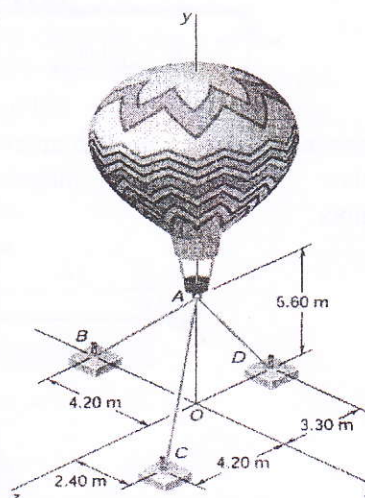


Fig.1b

- | | | | |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
| Q.2 | a) Define the following terms
1. Gravity axis 2. Center of gravity
3. Center of mass 4. Centroid | 06 | CO2 |
| | b) Four forces act on a 700 × 375-mm plate as shown in fig 2a. (a) Find the resultant in terms of magnitude and direction. (b) Determine x and y intercept | 10 | CO2 |

OR

- | | | | |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
| | Three children are standing on a 5.5-m × raft shown in fig.2b. If the weights of the children at Points A, B, and C are 375 N, 260 N, and 400 N, respectively, determine the magnitude and the point of application of the resultant of the three weights. | 10 | CO2 |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|

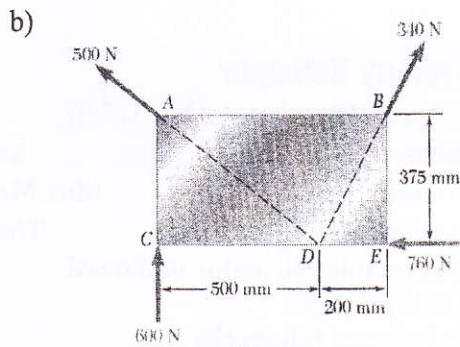


Fig.2a

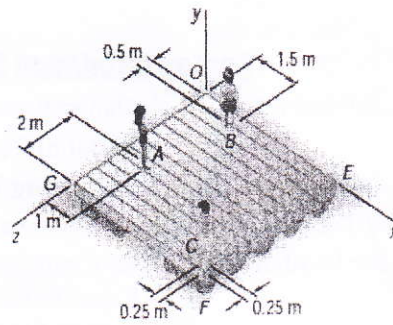


Fig.2b

Q.3 a) Explain in detail
1. Parallel axis theorem

03 CO3

b) Determine the support reaction for the beam loaded and supported as shown in fig.3a.

05 CO3

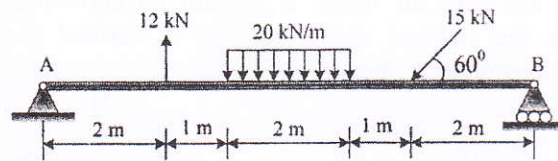


Fig.3a.

c) Determine the forces in each member of the truss shown in fig.3b and tabulate the results with magnitude and nature of force in the member.

08 CO3

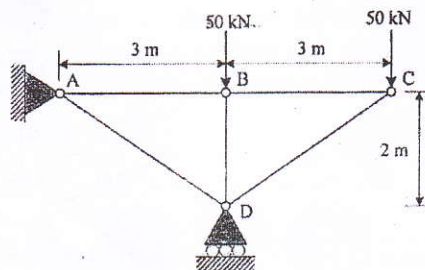


Fig.3b

OR

d) Knowing that the coefficient of static friction is 0.25 between the rope and the horizontal pipe and 0.20 between the rope and the vertical pipe shown in fig.3c. Determine the range of values of P for which equilibrium is maintained.

08 CO3

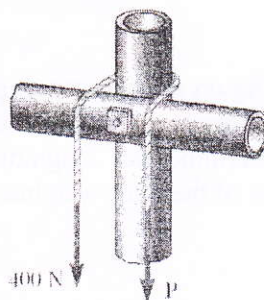


Fig.3c

Q.4

Solve any two

Marks COs
08 CO4

- a) Explain in detail
1. Dependent Motion 2. Relative motion 3. Projectile motion
- b) As relay runner 'A' enters the 20m long exchange zone with a speed of 12.9 m/s, he begins to slow down shown in fig.4a. He hands the baton to runner 'B' 1.82s later as they leave the exchange zone with the same velocity. Determine
(a) the uniform acceleration of each of the runners,
(b) when runner 'B' should begin to run.

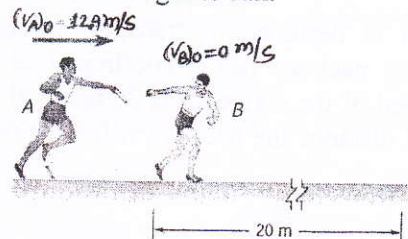


Fig.4a

- c) A motorist is traveling at 54 km/h when she observes that a traffic light 240m ahead of her turns red. The traffic light is timed to stay red for 24s. If the motorist wishes to pass the light without stopping just as it turns green again, determine
(a) the required uniform deceleration of the car,
(b) the speed of the car as it passes the light.

08 CO4

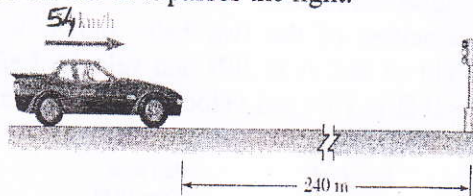


Fig.4b

Q.5

Solve any two

- a) Block 'A' has weight 300N and Block 'B' has weight 50N as shown in fig.5a. Determine speed of block 'A' after it moves 1.5m down the plane, starting from rest, Neglect friction and mass of the pulleys.

08 CO5

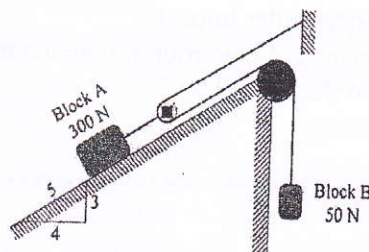


Fig.5a

- b) A 180 N man and a 120 N woman stand at opposite ends of a 300 N boat, shown in fig.5b ready to dive, each with a 16 m/s velocity relative to the boat. Determine the velocity of the boat after they have both dived, if (a) the woman dives first (b) the man dives first.

08 CO5



Fig.5b

- c) The conveyor belt is designed to transport packages of various weights. Each 50kg package has a coefficient of kinetic friction $\mu_k=0.20$. If the speed of the conveyor is 25m/s, and then it suddenly stop, determine the distance the package will slide on the belt before coming to rest.

08 CO5

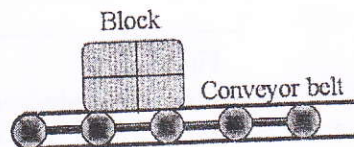


Fig.5c.

- Q.6 a) Explain the following terms

04 CO6

1. Principle of work-energy
2. Principle of impulse-momentum

- b) Determine the velocities of the two balls shown in Fig.6a after impact. Take weight of ball A is 20N and velocity before impact is 6m/s, weight of ball B is 10N and velocity before impact is 8m/s and coefficient of restitution is 0.6.

07 CO6

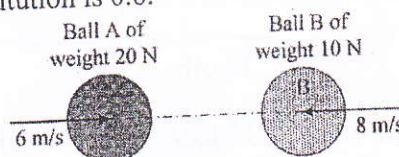


Fig.6a

- c) A hammer of mass 1200 kg drops from a height of 90cm on a pile of mass 700kg. Find
- a) The Common Velocity after impact
 - b) The Average resistance of the ground if pile comes to rest after penetrating 10cm into the ground.
 - c) Loss of Kinetic Energy

07 CO6