

**Internal Assessment Test – II**  
**Engineering Mechanics**

Class: F.E.

Marks: 20

Duration: 60 min

**Instructions:**

1. Question no 1 is **compulsory**
2. Solve any **ONE** from the remaining questions.
3. Figures to the right indicate full marks

**Q1 a)** Define the following terms

[5]

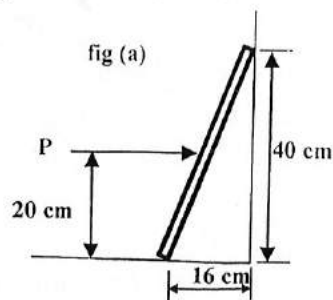
- |                     |                       |
|---------------------|-----------------------|
| i) Truss            | iv) Angle of Friction |
| ii) Relative Motion | v) Projectile         |
| iii) Displacement   |                       |

**Q1 b)** The position of a particle travelling along the X axis is given by the expression  $x = (t^3 - 4t^2 + 5)$  where 'x' is in meters and 't' is in seconds. Determine the velocity and acceleration at  $t=2s$ .

3

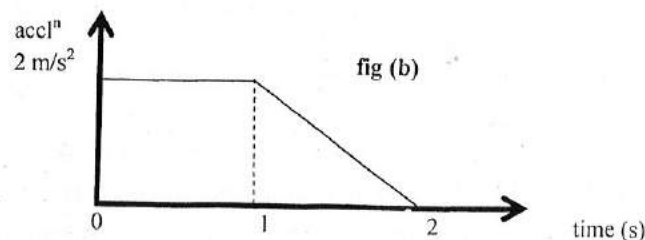
**Q2 a)** A uniform rod AB is held in position as shown in fig (a). If the coefficient of friction at the wall and at the ground is 0.15, calculate the magnitude of the force P to HOLD the ladder from impending downwards.

[6]



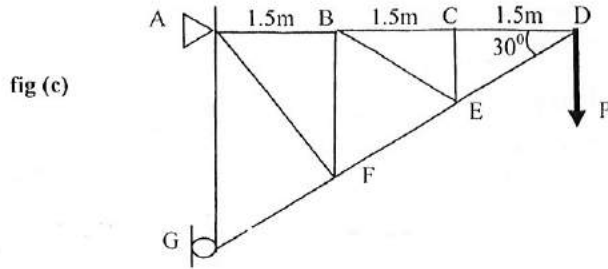
**Q2 b)** The acceleration – time diagram of a particle of as shown in the fig (b). Draw the corresponding velocity-time and displacement –time diagrams Assume that the particle starts from rest at the origin i.e. at  $t=0$ ,  $x=0$  and  $v=0$ .

[6]



**Q3 a)** For the truss loaded as shown in fig (c), identify all the Zero force members and find the magnitude and nature in the remaining members by the method of joints.

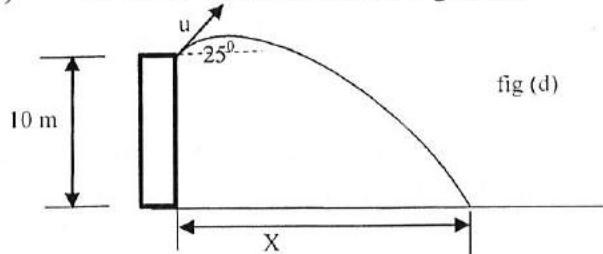
[6]



**Q3 b)** A ball is projected from the top of the tower 110 m high with a velocity of 100m/s at an angle of elevation of  $25^\circ$  to the horizontal. Neglecting the air resistance, determine

- i) The horizontal distance where it strikes the ground
- ii) The velocity with which it strikes the ground
- iii) The time taken to reach the ground.

[6]

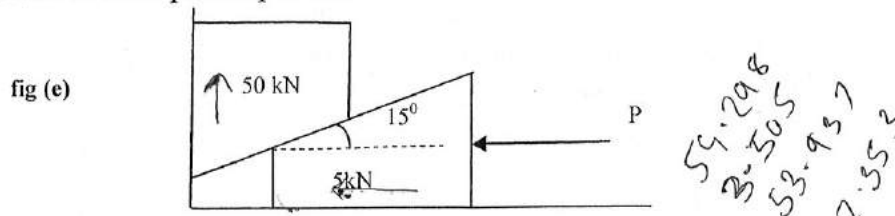


**Q4 a)** The depth of a well upto the water surface is H in meters. A stone is released from the ground and the splash is heard after 4 seconds. If the velocity of the sound is assumed to be 330 m/s, find the depth H of the water surface from the ground.

[6]

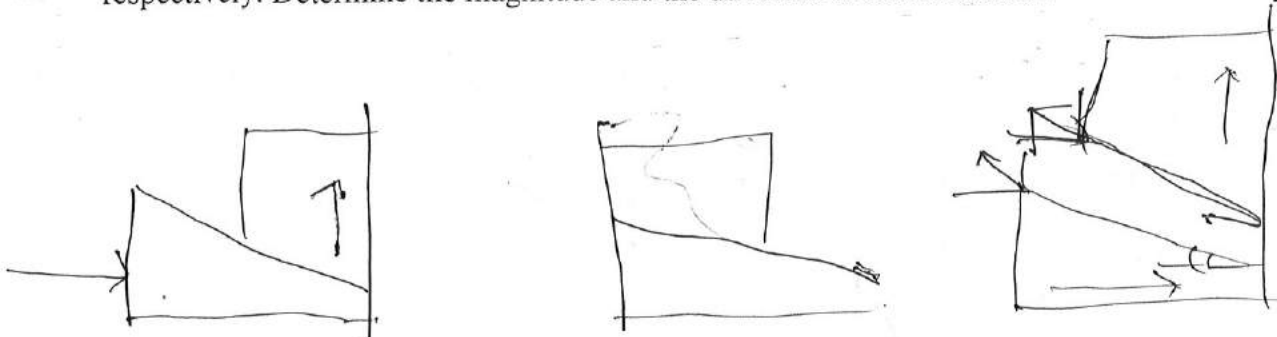
**Q4 b)** A block of weight 50kN is kept in equilibrium by a wedge below it as shown in the fig(e) If the coefficient of friction at all surfaces is 0.2, determine the force P necessary to cause the block A to impend upwards.

[6]



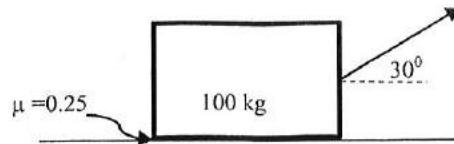
**Q5 a)** The lines of action of three concurrent forces at 'O' pass respectively through points  $A=(-1,2,4)$ ,  $B=(3,0,-3)$  and  $C=(2,-2,4)$  m. The magnitude of the forces are 40N, 10N and 30N respectively. Determine the magnitude and the direction of their resultant.

[6]



**Q5 b)** An automobile A moves towards EAST at a speed of 6m/s. At the same time another automobile B moves with 5m/s in a direction  $60^\circ$  north of West. Determine the relative position and velocity of the automobile A with respect to B after 5 seconds of motion. [6]

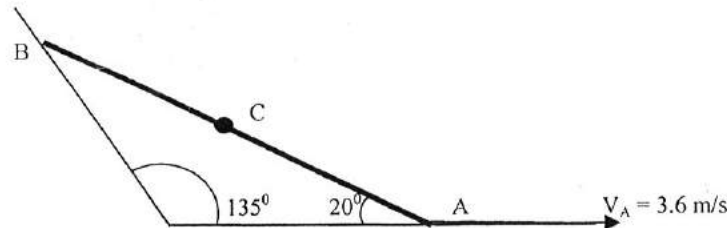
**Q6 a)** A 100kg block is placed on a rough horizontal surface having a coefficient of kinetic friction as 0.25. If a force 750 N force is applied as shown find the acceleration of the block. [4]



**Q6 b)** Define the terms [4]

- i) Co-efficient of Restitution
- ii) Perfectly Elastic Impact

**Q6 c)** A 3m long homogeneous bar slides down the plane shown. The velocity of the end A is 3m/s to the right. Determine the angular velocity of the BAR and the linear velocity of the center C of the bar. [4]



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