Seat No. | | | | | | |

* 2 5 3 7 *

AOI 1317

Engineering Mechanics
(Old) (1060)

P. Pages : 7

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Figures to the right indicate full marks.
6. Use of non programmable calculator is allowed.
7. Assume suitable data if necessary.

UNIT - I

1. a) i) State Newton's three law's of motion and explain in briefs. **5**

ii) Determine force 'F' if resultant of three forces act, vertically downward at point A refer Fig. 1. **5**

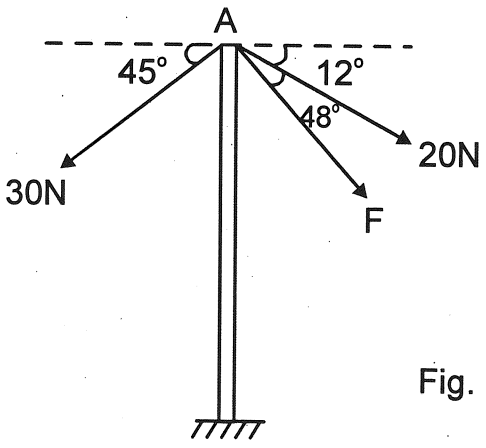

Fig. 1

b) A beam is simply supported at A and Hinged at B. Determine reactions at supports refer fig. 2. **10**

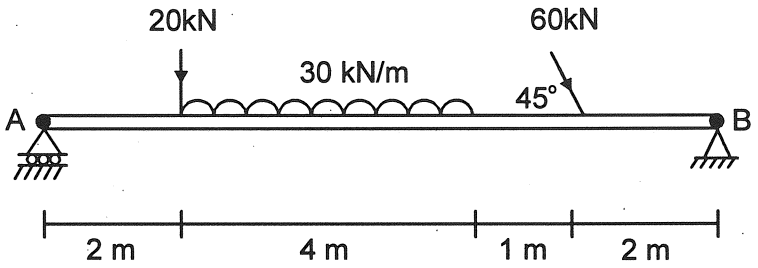

Fig. 2

c) i) A force acts at origin defined by angles $\theta_y = 60^o$ and $\theta_z = 45^o$. If x - component of force is - 800 N, Find :

i) other component of force and

ii) Value of θ_x. **5**

ii) A system is kept in equilibrium by two equal forces P and Q as shown in fig. 3. Find angle B for equilibrium. The pulley is frictionless. **5**

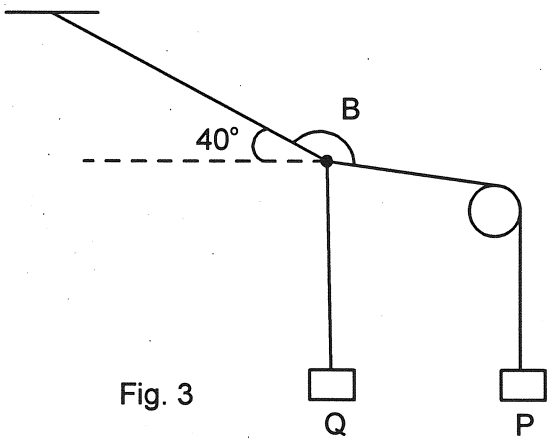

Fig. 3

UNIT - II

2. a) i) Derive the equation for M.I. of rectangle about it's centroidal axis which is parallel to it's base. **5**

AOI 1317

ii) Locate the centroid of shaded area as shown in fig. 4. **5**

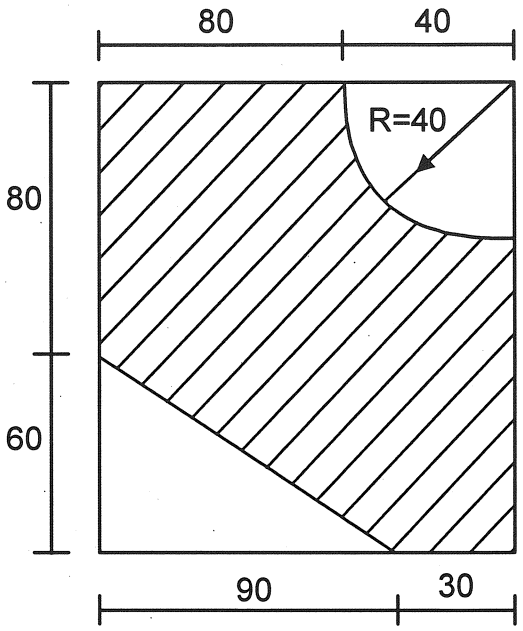

Fig. 4

b) Find the forces in the members of truss shown in Fig. 5. **10**

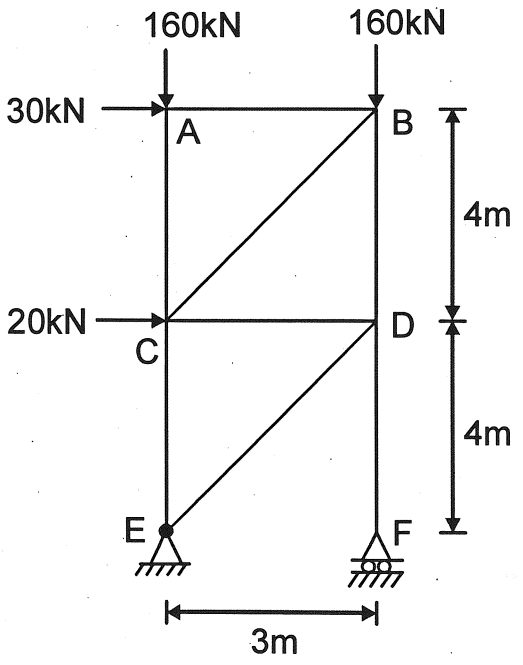

Fig. 5

AOI 1317

c) Determine weight 'W' to keep system in equilibrium. Also find tensions in various parts of lables refer fig. 6. **10**

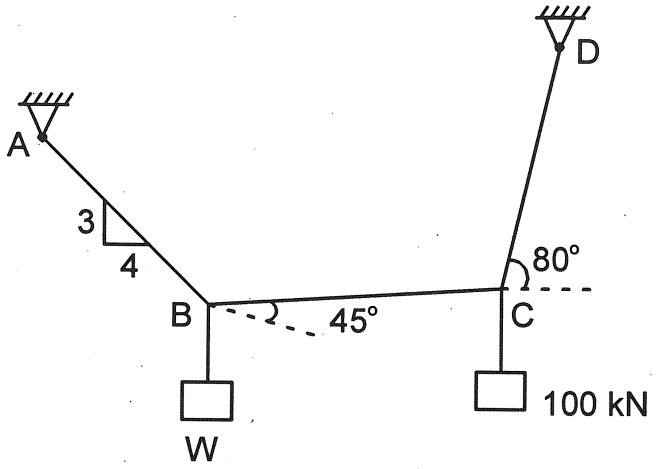

Fig. 6

UNIT - III

3. a) i) Define displacement, velocity, speed, path of particle and retardation. **5**

ii) A stone is thrown upward from top of building 25 m above the ground with velocity 18 m/sec. Find :

a) time when it reaches maximum height.

b) maximum height.

c) velocity with which it strikes the ground. **5**

b) A train is moving due east at 200 km/hr. While car B is moving at 100 km/hr in northwest direction. At this instant car B is 10 km south of A determine :

i) Relative velocity of car B w.r.t. car A

ii) Shortest distance between A and B. **10**

c) i) State and explain D'Alembert's principle

ii) At an instant shown block B is moving downward at a speed of 1m/sec. Determine velocity of 4kg block A when t = 1 sec. Assume $\mu k = 0.15$ between horizontal plane and block A refer fig. 7. **5**

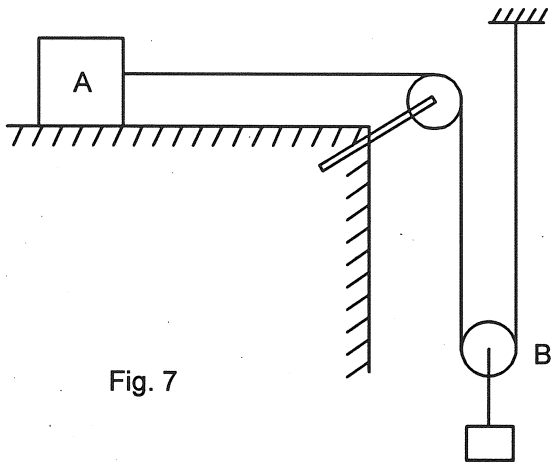

Fig. 7

UNIT - IV

4. a) i) Derive the equations of angular motion for a body rotating with uniform angular acceleration. **5**

ii) Power supply was cut off to a power driven wheel when it was rotating at a speed of 900 rpm. It was observed to come to rest after making 360 revolutions. Determine angular retartation and time it took to come to rest after power supply was cut off. **5**

b) For the linkage shown rod AB has angular velocity of 22 rad/sec ↻ find angular velocity of rod BC and rod CD also find linear velocity of point C refer Fig. 8. **10**

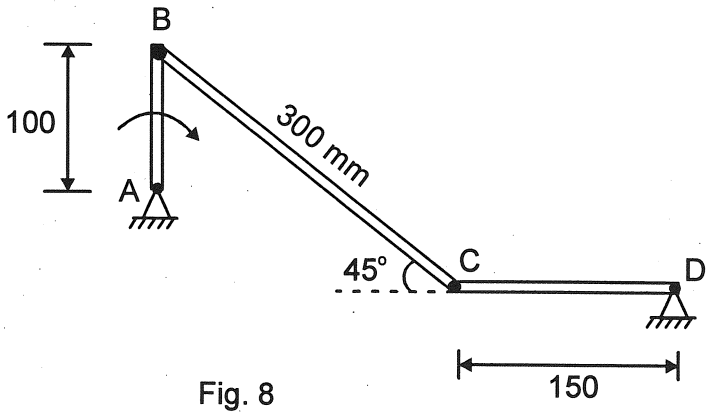

Fig. 8

c) i) Explain general plane motion of rigid body. **5**

ii) A uniform cylinder of mass 10 kg and diameter 1 metre is being pulled along an inclined plane by force 100N as shown in fig.9. Find the angular acceleration of cylinder also find linear acceleration of it's mass centre. **5**

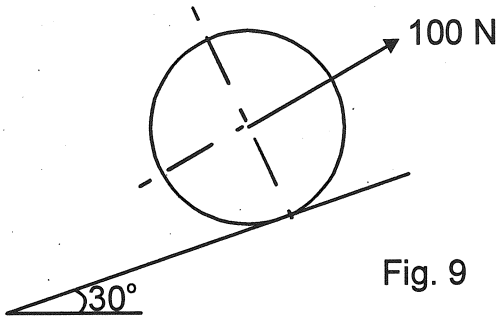

Fig. 9

UNIT - V

5. a) i) Define angle of repose, resultant reaction, angle of friction, coefficient of friction and wedge. **5**

ii) A rope is wound thrice around a post as shown in fig. 10 and it has to support a load of 10 kN at the end. The coefficient of friction is 0.3. Determine minimum force P for which rope remains in equilibrium. **5**

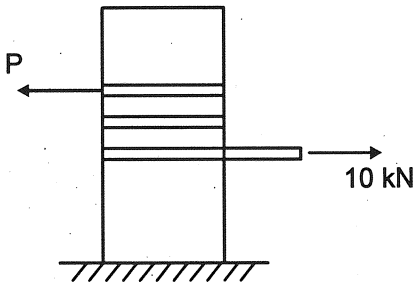

Fig. 10

b) i) Derive the equations for time of flight, horizontal range and maximum height for a projectile projected on horizontal plane. **5**

AOI 1317

ii) For the system shown in fig. 11 find the minimum force P to start the motion of block to the left. The coefficient of friction between block and plane is 0.35 and pulley is frictionless. **5**

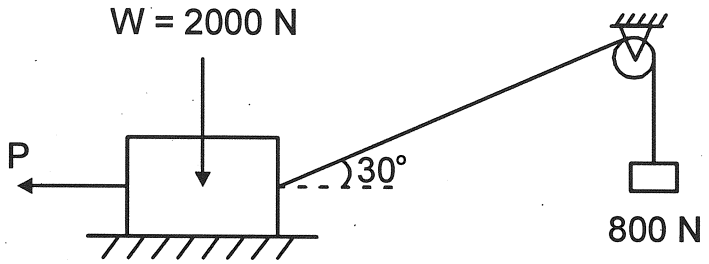

Fig.11

c) A car is travelling on curved fiction of highway of radius 700 m at a speed of 90 km/h. Breaks are suddenly applied and after 8 seconds speed of car has been reduced to 70 km/h. What is the total acceleration when breaks are suddenly applied and at the time f = 8 seconds. **10**

****