

QP Code : MV-17684

**(OLD COURSE)**

(3 Hours)

[ Total Marks : 100

- N. B. : (1) Question No. 1 is compulsory.  
 (2) Solve **any four** from remaining six questions.

1. (a) Write the output for the following code. 3

```
void main ()
{ int x;
  for (x=-1;x++)
  { if (x<5)
    { cout<<"c++"<<"\n";
      continue; }
    else
      break;
    cout<<"c++";
  }
}
```

- (b) Write the output for the following code. 2

```
void main ()
{ int a=3;
  cout << ++a << a++ << ++a << a;
}
```

- (c) Explain Relational operator with example. 3  
 (d) Define array? Write example for one dimension and two dimensions. 2  
 (e) WAP to find sum and its average of n integer values in a given array. 5  
 (f) Compare constructor v/s destructor. 5

2. (a) WAP to generate output in following order. Using for loop. 10

```
1A
12BA
123CBA
1234DCBA
```

- (b) Write a menu driven program to simulate calculate for operations like addition subtraction, multiplication and division. Using switch statement. 10

3. (a) Explain static data member and static member function with example. 10  
 (b) WAP to generate Fibonacci series using constructor. 10

[ TURN OVER

4. (a) Define function overloading? WAP to find product of two numbers of type int, float, double. 10
- (b) Define recursion? Write a recursive program to find GCD of two integer numbers. 10
5. (a) WAP to count number of vowels, digits and blank space in a given string. 10
- (b) Create a structure player with members name, inn, and runs. WAP to compare runs scored by each player and arrange them in descending order. 10
6. (a) Explain multiple inheritance and write a program using the concept of multiple inheritance. 10
- (b) WAP to add two complex number using operator overloading concept. (overload + operator) 10
7. Write short note on (any four) 20
- (i) virtual function
  - (ii) structure and union
  - (iii) abstract class
  - (iv) friend function
  - (v) function overriding.
- .....

**(OLD COURSE)**QP Code: **MV-17673**

(2 Hours)

[ Total Marks : 75

- N.B. :
- (1) Q.1 is compulsory.
  - (2) Solve any **four** questions from Q.2 to Q.7
  - (3) Symbols have their usual meanings.
  - (4) Assume suitable data wherever necessary.
  - (5) Figures to the right indicate full marks.

1. Answer any **Five** from the following :- 15
  - (a) Draw the following in cubic unit cell -  
(1) (1 0 2)    (2)  $(\bar{2} 1 3)$     (3) [1 2 1]
  - (b) Write the condition for obtaining maxima in Bragg's X-ray diffraction experiment. Also write meaning of terms in it.
  - (c) Write the differences between semiconductor and insulator.
  - (d) The mobility of holes is  $0.025 \text{ m}^2/\text{VS}$ . What would be the resistivity of P-type semiconductor if the Hall coefficient of the sample is  $2.25 \times 10^{-5} \text{ m}^3/\text{c}$ .
  - (e) Explain the application of superconductivity called SQUID.
  - (f) What do you mean by reverberation time? Write Sabine's formula and give meaning of terms in it.
  - (g) Define piezoelectric and inverse piezoelectric effect.
2. (a) Draw diamond crystal structure and write down the steps followed for drawing it. Calculate atomic radius and atomic packaging factor for diamond structure. 8
- (b) Define Hall effect. Explain how electric and magnetic forces balance each other in Hall effect experiment. 7
3. (a) Define superconductivity. Differentiate between Type - I and Type - II superconductors. 8
- (b) Draw block diagram of CRO and explain various functions of it. 7
4. (a) Define packing efficiency. Calculate packing efficiency for FCC unit cell. 5
- (b) Explain classification of solids on the basis of band theory of solids. 5
- (c) State acoustic requirements of good auditorium. 5
5. (a) Silicon has the same structure as that of diamond. Its density is  $2.3 \times 10^3 \text{ kg/m}^3$  and atomic weight is 28.9. Calculate lattice constant and atomic radius. Avogadro's Number -  $6.023 \times 10^{26}/\text{kmol}$ . 5
- (b) How depletion region is formed in PN junction diode? Explain with neat diagram. 5
- (c) Explain construction and working of magnetostriction oscillator with neat circuit diagram. 5

6. (a) X-rays of wavelength  $0.97 \text{ \AA}$  are incident on the planes (1 1 1) of cubic unit cell having dimension  $4.08 \text{ \AA}$ . At what glancing angle second order bragg reflection will occur? What will be the maximum order that can be reflected? 5
- (b) Describe Meissner effect. Show that superconductors are perfect diamagnetic below their critical temperature. 5
- (c) Explain cavitation effect. Give some applications of it. 5
7. (a) What are crystal defects? Explain vacancy point defects. 5
- (b) Hall of dimension  $20 \times 15 \times 10 \text{ cm}^3$  has average absorption coefficient 0.1. Find the reverberation time if curtain of  $100 \text{ m}^2$  is suspended at the center of hall with absorption coefficient 0.66. What will be change in reverberation time? 5
- (c) Explain magnetostatic focusing. 5
-

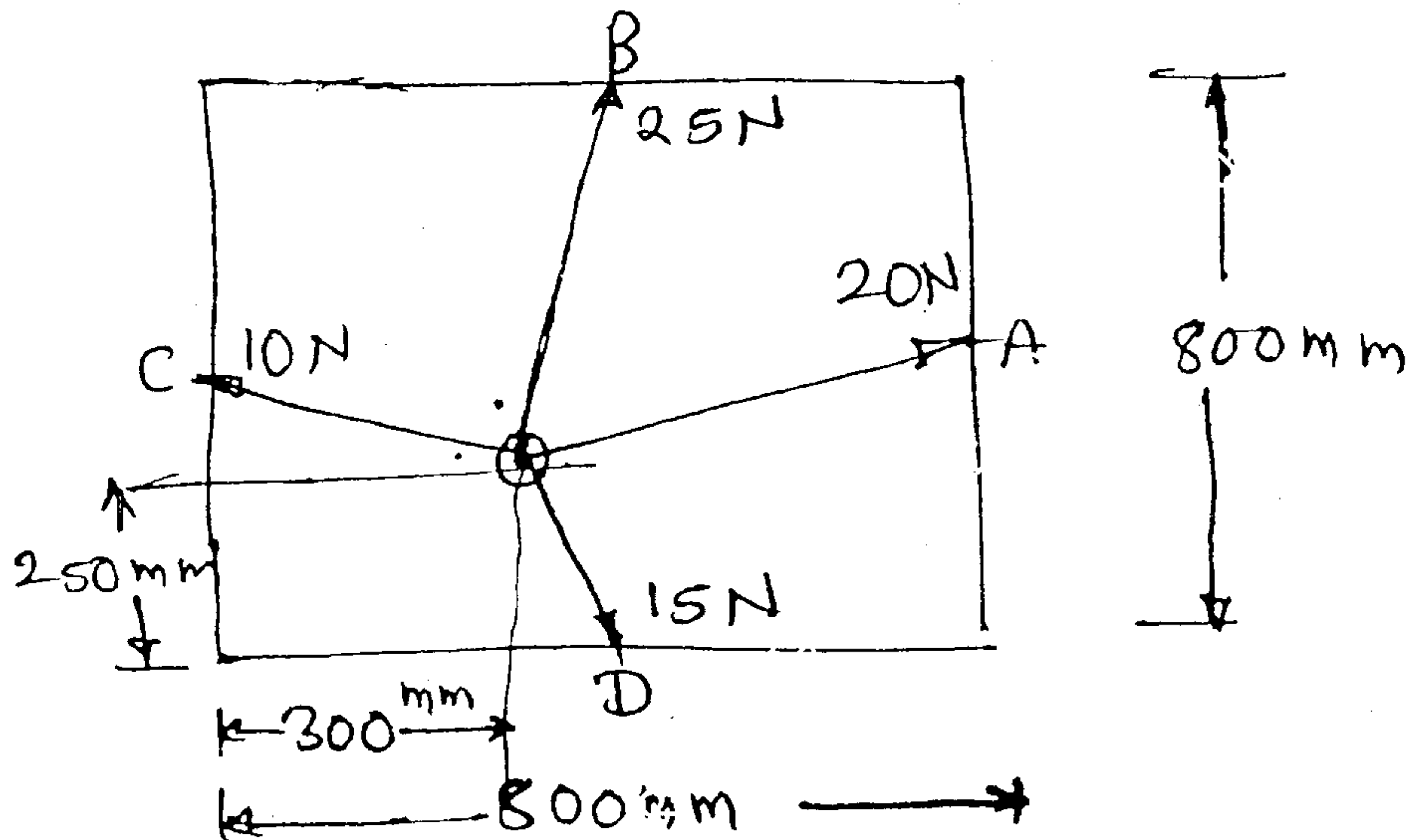
**(OLD COURSE)**

(3 Hours)

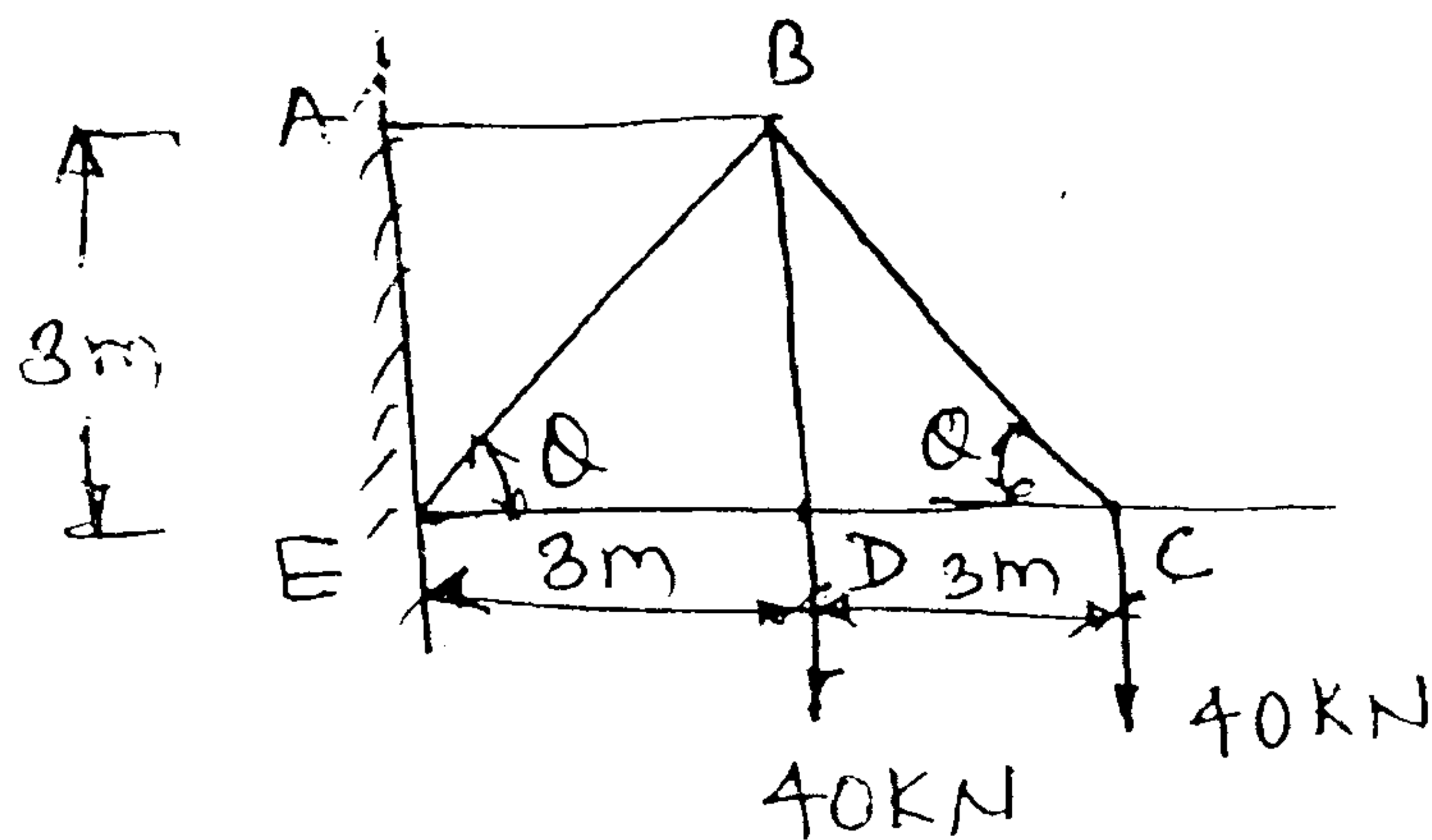
[ Total Marks : 100

- N. B. : (1) Question No. 1 is compulsory.  
 (2) Attempt any four from remaining.  
 (3) Assume suitable data wherever necessary and mention it clearly.

1. (a) The striker of a carrom board lying on the board is pulled by four players as shown in fig. The players are sitting exactly at centre of four sides. Determine the resultant of forces in magnitude and direction. 4

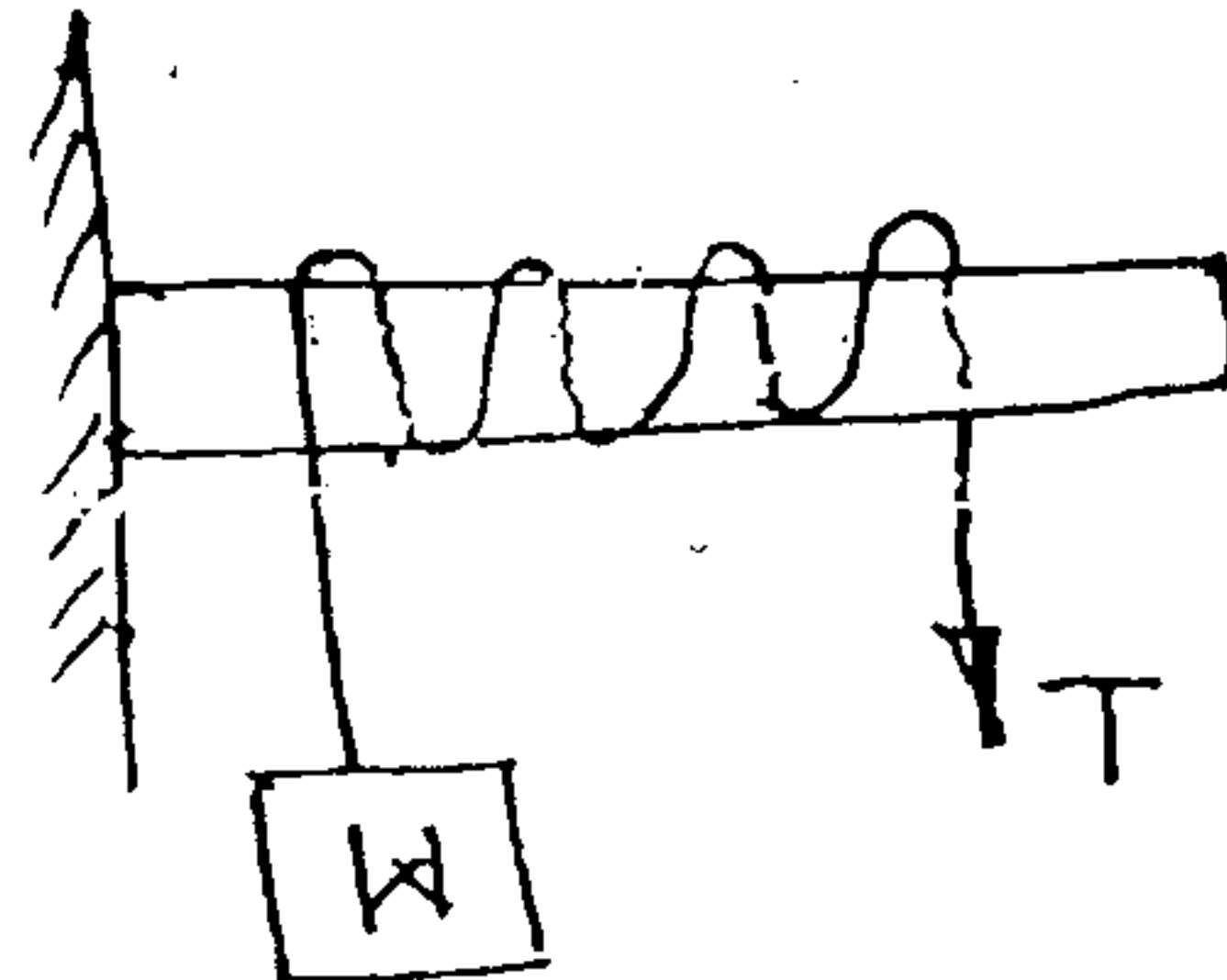


- (b) Find forces in all members of truss as shown. 4

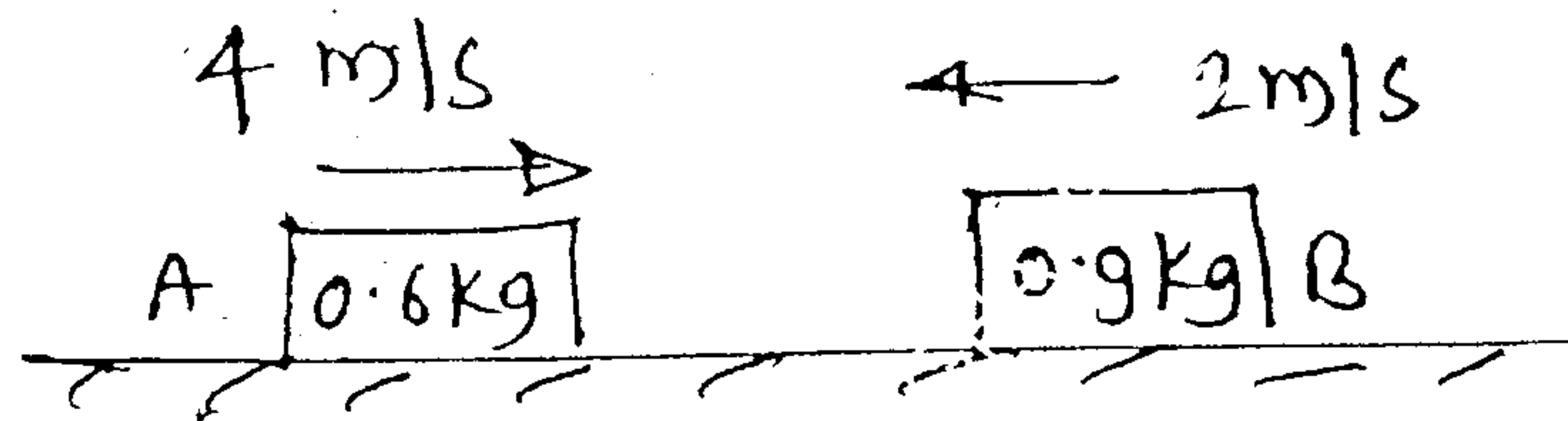


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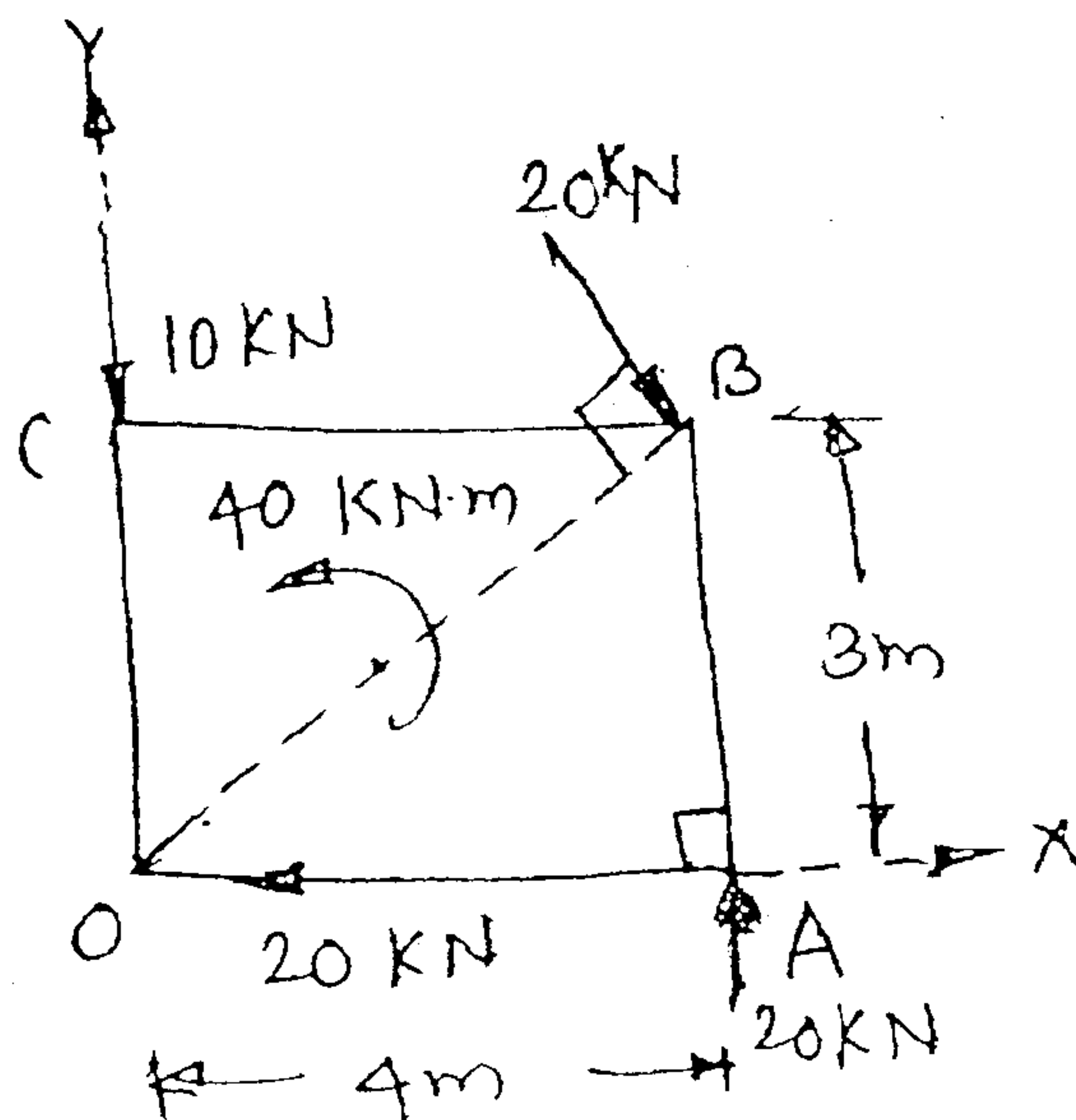
- (c) A rope is wrapped three turns around a cylinder as shown. Determine the force required to just support a weight of 1 KN. Coefficient of friction between rope and cylinder is 0.3. 4



- (d) A point is moving with uniform acceleration. In 11<sup>th</sup> & 15<sup>th</sup> second from commencement, it moves through 7.2 m and 9.6 m respectively. Find its initial velocity and acceleration with which it moves. 4
- (e) Two blocks approaching each other along smooth surface, along same line are shown. After impact, velocity of 'B' is observed to be 2.5 m/s to the right. Determine coefficient of restitution. 4

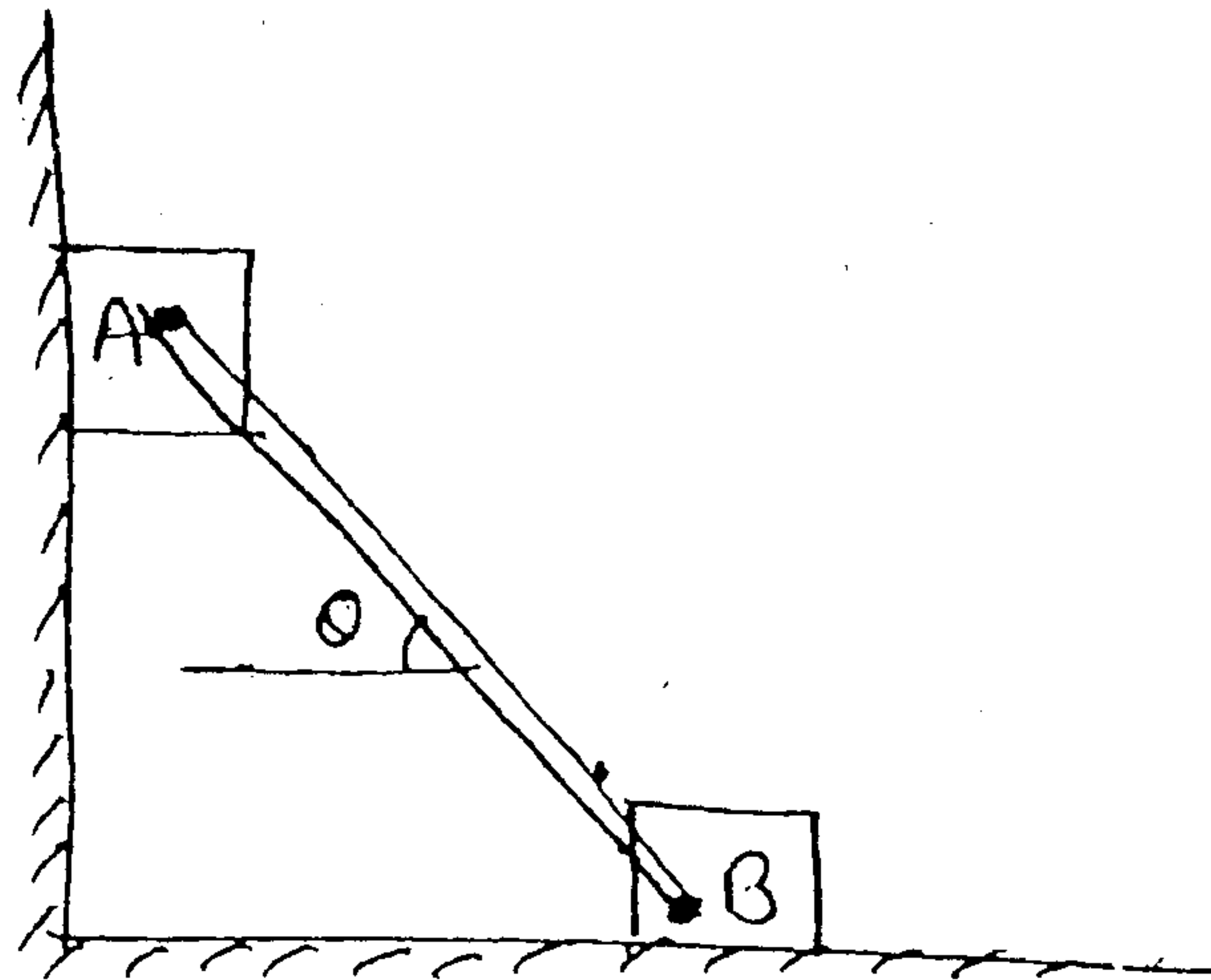


2. (a) Find the resultant of the force system acting on a body OABC, shown in fig. Also find points where the resultant will cut the X & Y axis. What is the distance of resultant from 'O'. 8

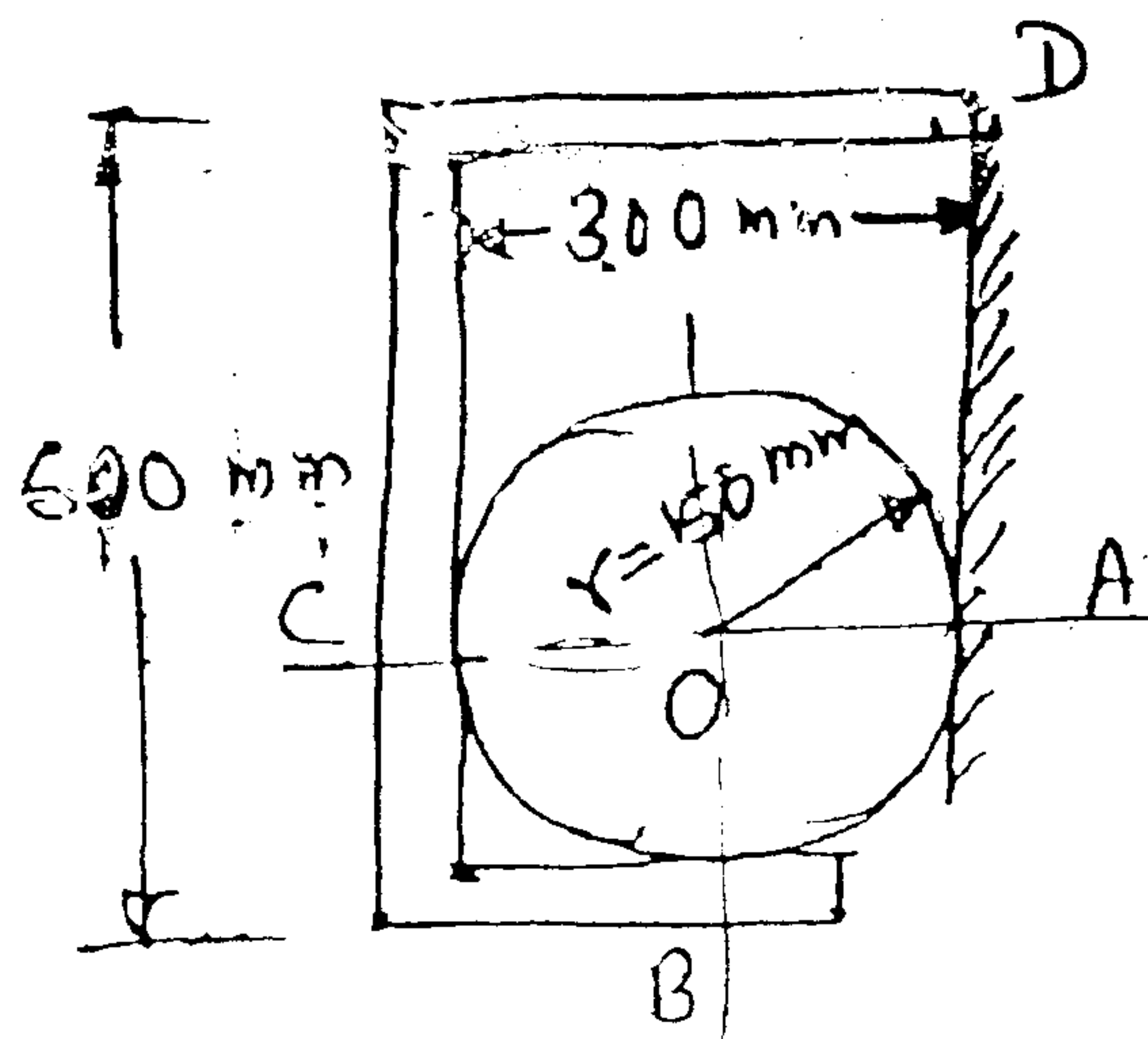


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- (b) Two identical blocks A and B are pin connected by rod and rest against vertical and horizontal planes as shown. If sliding impends when  $\theta = 45^\circ$ , determine the coefficient of friction ' $\mu$ ' assuming it to be the same at both floor and wall. 6



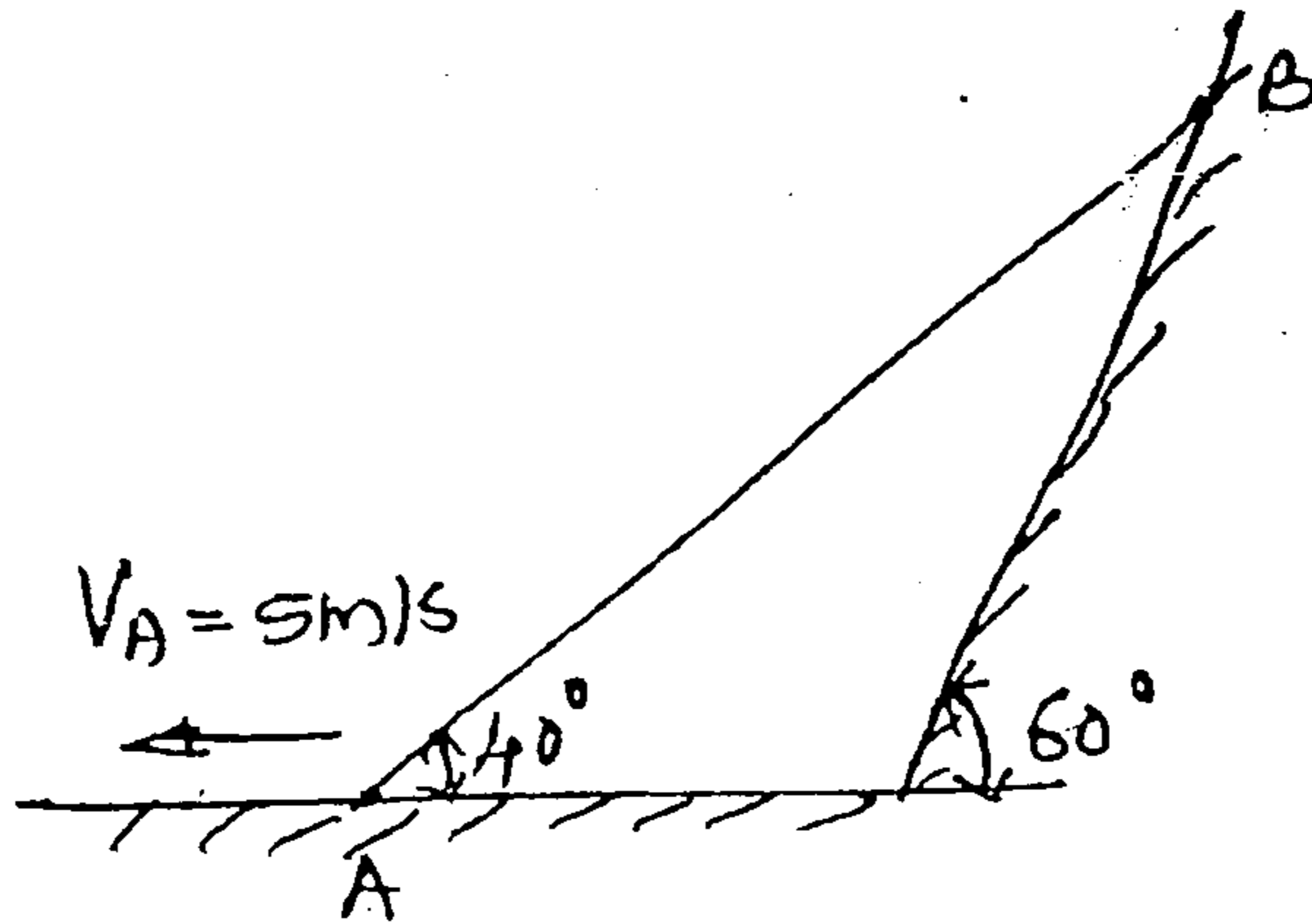
- (c) If  $x = (1 - t)$  and  $y = (t)^2$ , where ' $x$ ' and ' $y$ ' are in meters and ' $t$ ' is in seconds, determine  $x$  and  $y$  components of velocity and acceleration. Also write equation of path. 6
3. (a) A 600 N cylinder is supported by the frame BCD as shown. The frame is hinged at D. Determine the reactions at A, B, C and D. 8



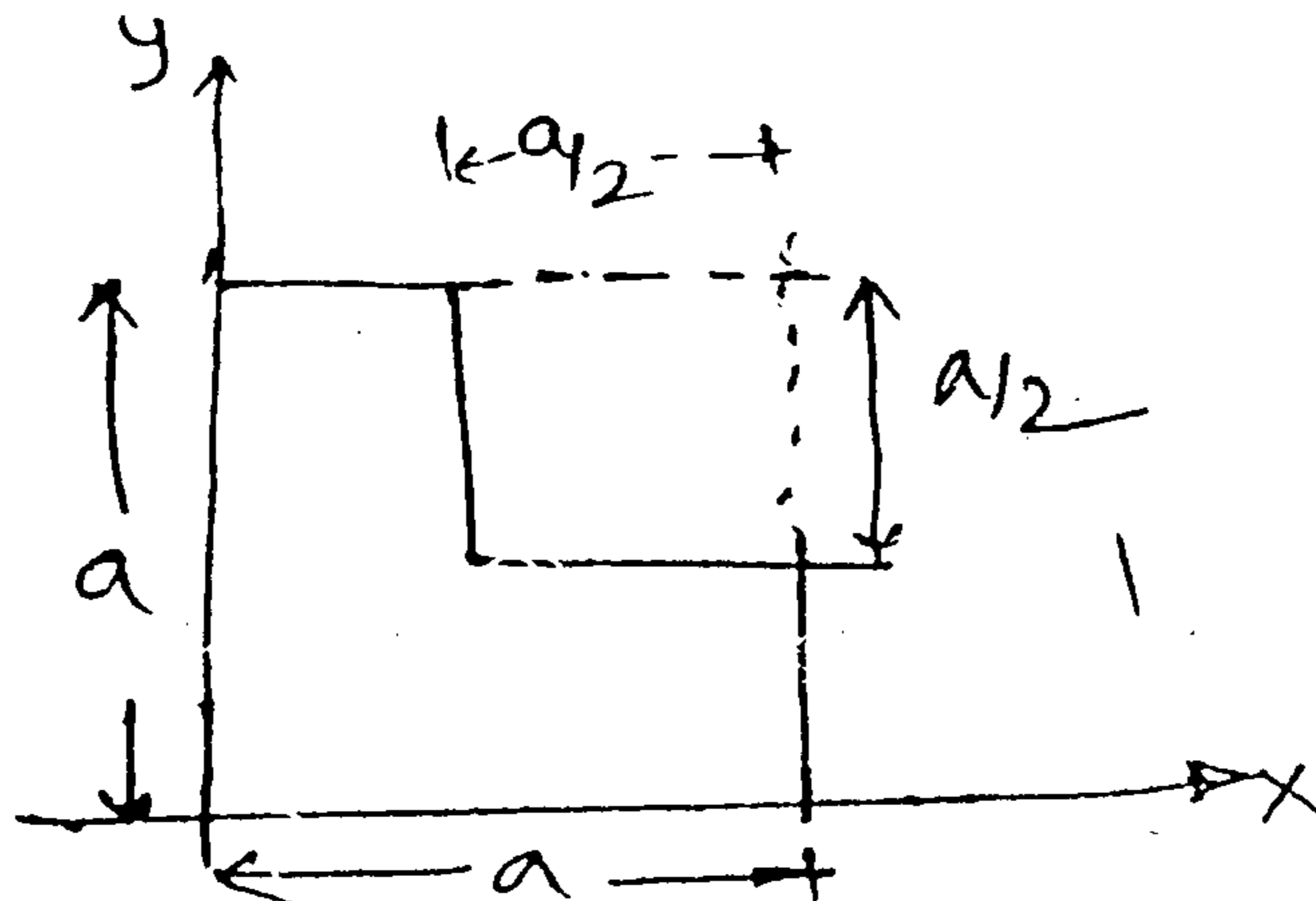
- (b) A projectile is aimed at a target on the horizontal plane and falls 12 m short when the angle of projection is  $15^\circ$ , while it overshoots by 24 m when the angle is  $45^\circ$ . Find the angle of projection to hit the target. 6

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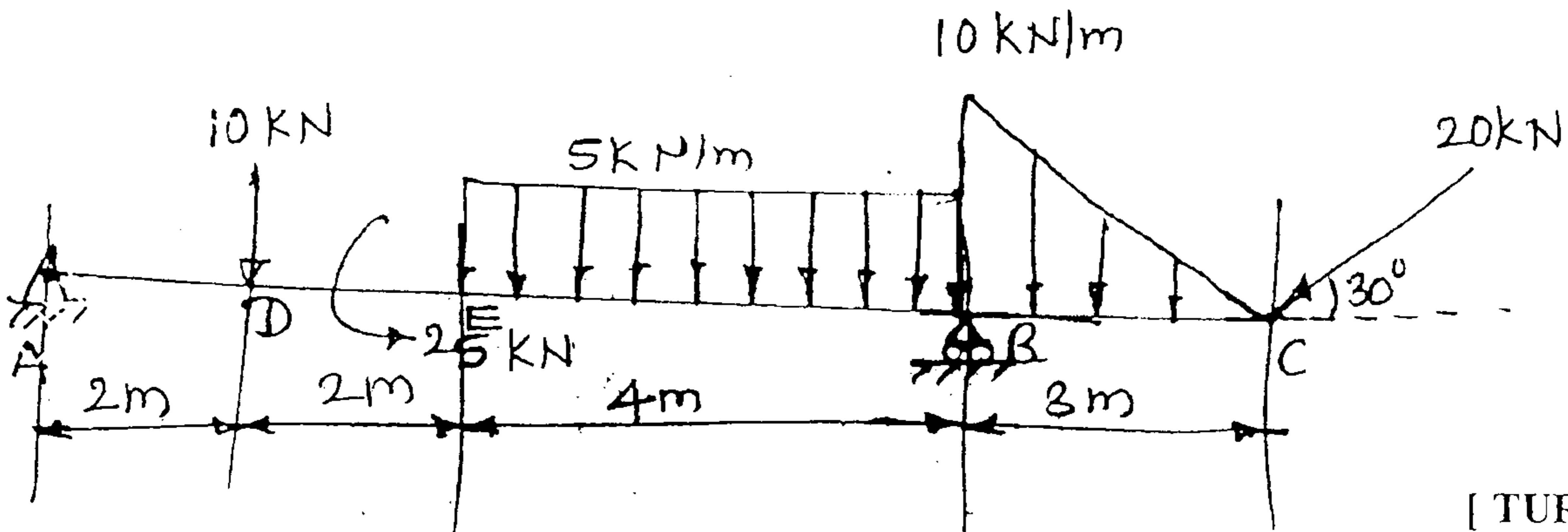
- (c) Rod AB is 2 m long and slides with its ends in contact with the floor and the inclined plane. At the instant when AB makes an angle  $40^\circ$  with horizontal, point 'A' has leftward velocity 5 m/s. Determine angular velocity of rod and the velocity of end B. 6



4. (a) Find coordinates of the area left after removing a square area from plate as shown. 4



- (b) A beam is hinged at 'A' and roller support at B. It is acted upon loads as shown in fig. Find reactions at A and B. 8



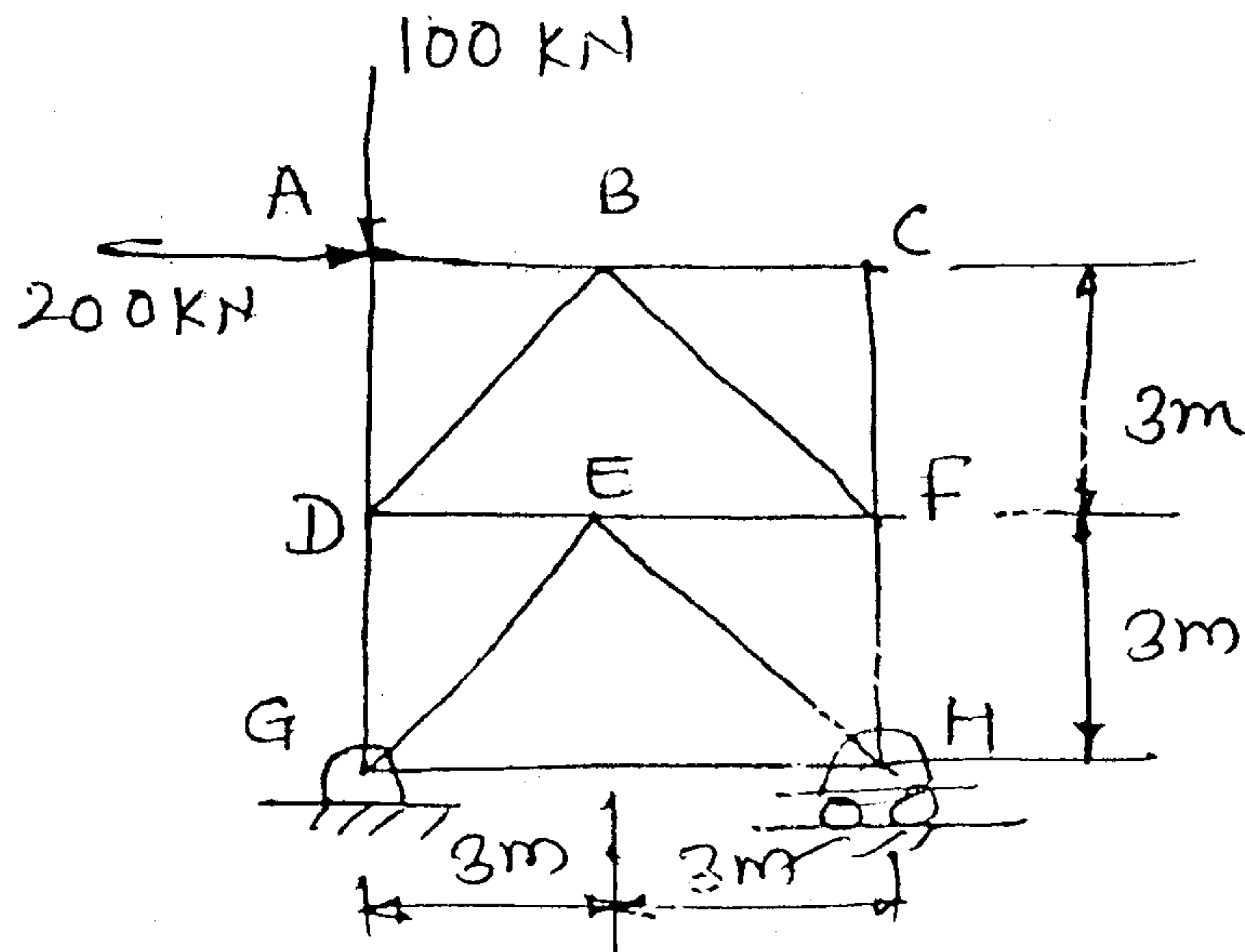
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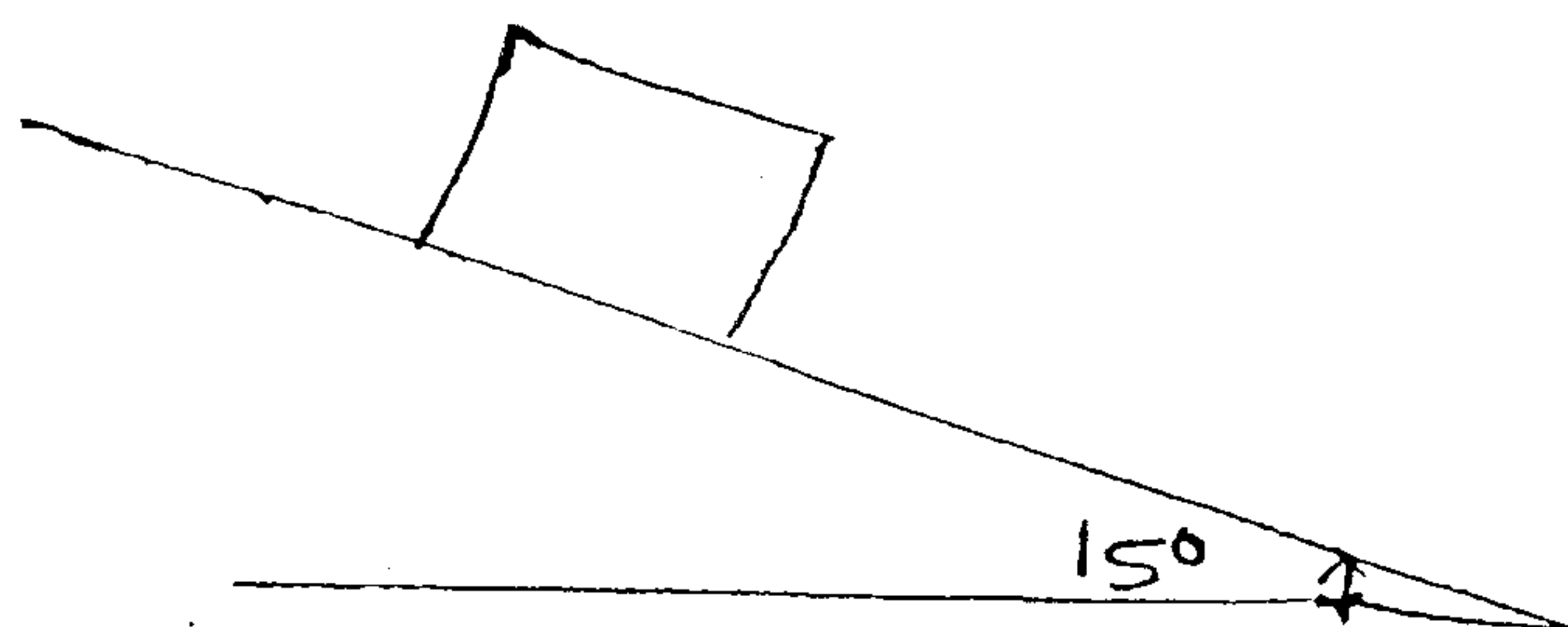
- (c) A car enters a curved portion of the road of radius 200 m travelling at a constant speed of 36 km/hr. Determine the components of velocity and acceleration of the car in the x and y directions 15 seconds after it has entered the curved portion of the road. 8

Also express the velocity and acceleration of the car in terms of normal and tangential components.

5. (a) Find forces in members DG and FH by method of sections. 6



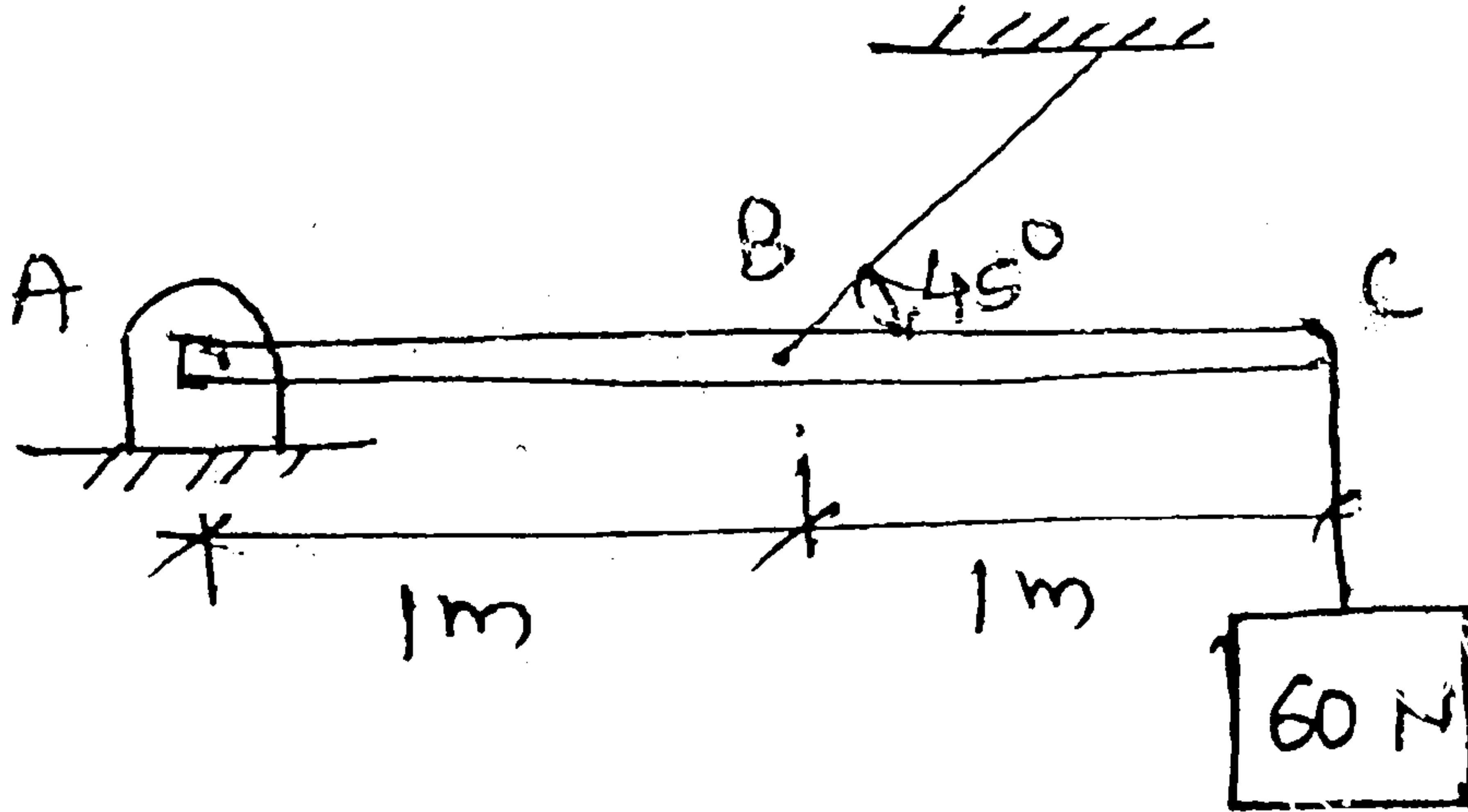
- (b) Find the number of ropes required to transmit 50 KW. The maximum permissible tension in the rope is 1500 N, velocity of rope is 10 m/s and the weight of rope is 4 N/m. Assume angle of contact as  $180^\circ$  and pulley groove angle as  $60^\circ$ . 8
- (c) A 500 N crate kept on the top of a  $15^\circ$  sloping surface is pushed down the plane with an initial velocity of 20 m/s. If  $\mu_s = 0.5$  &  $\mu_k = 0.4$ , determine the distance travelled by the block and the time it will take as it comes to rest. 6



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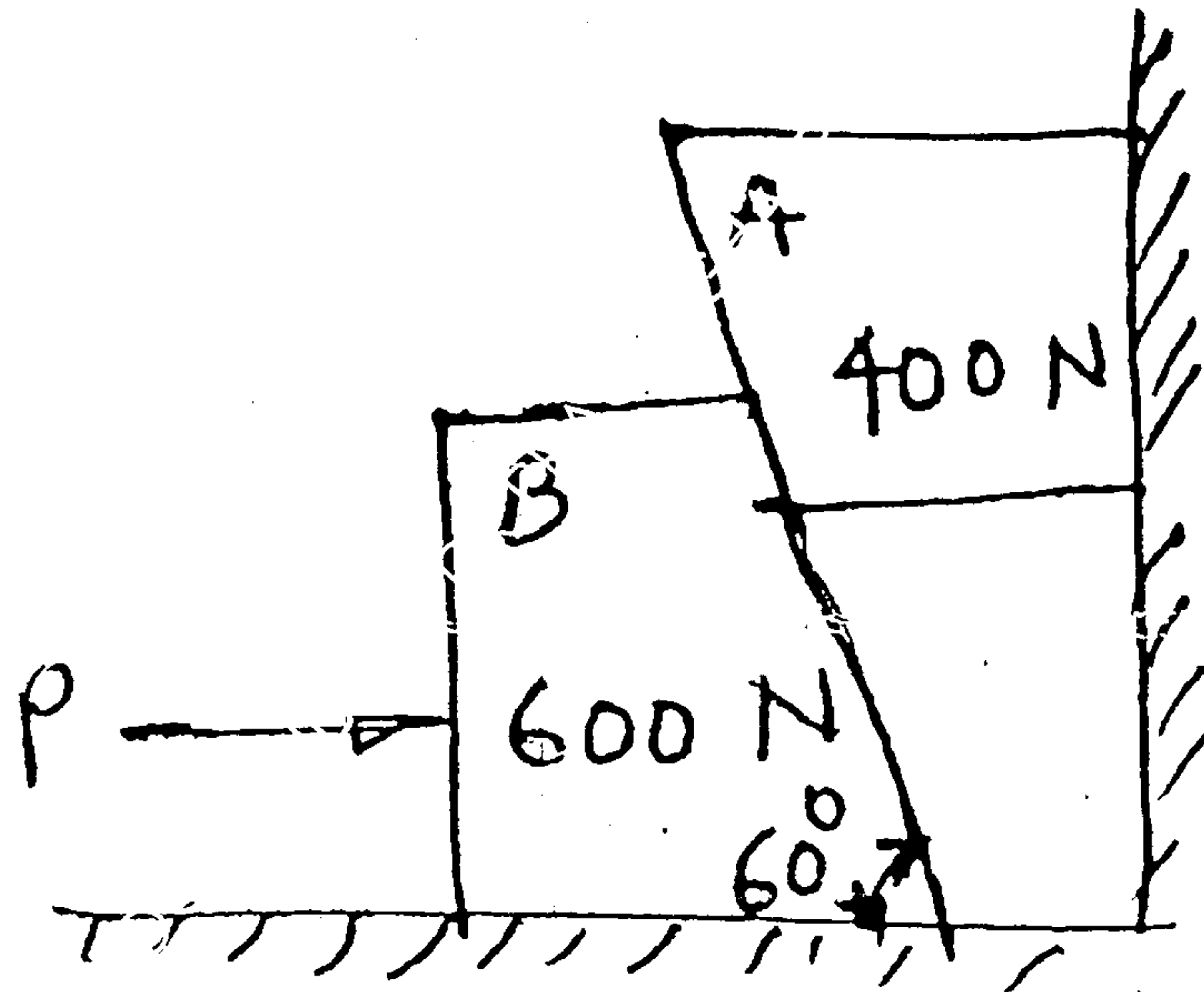
6. (a) Find the tension in cable and the hinge reaction.

6



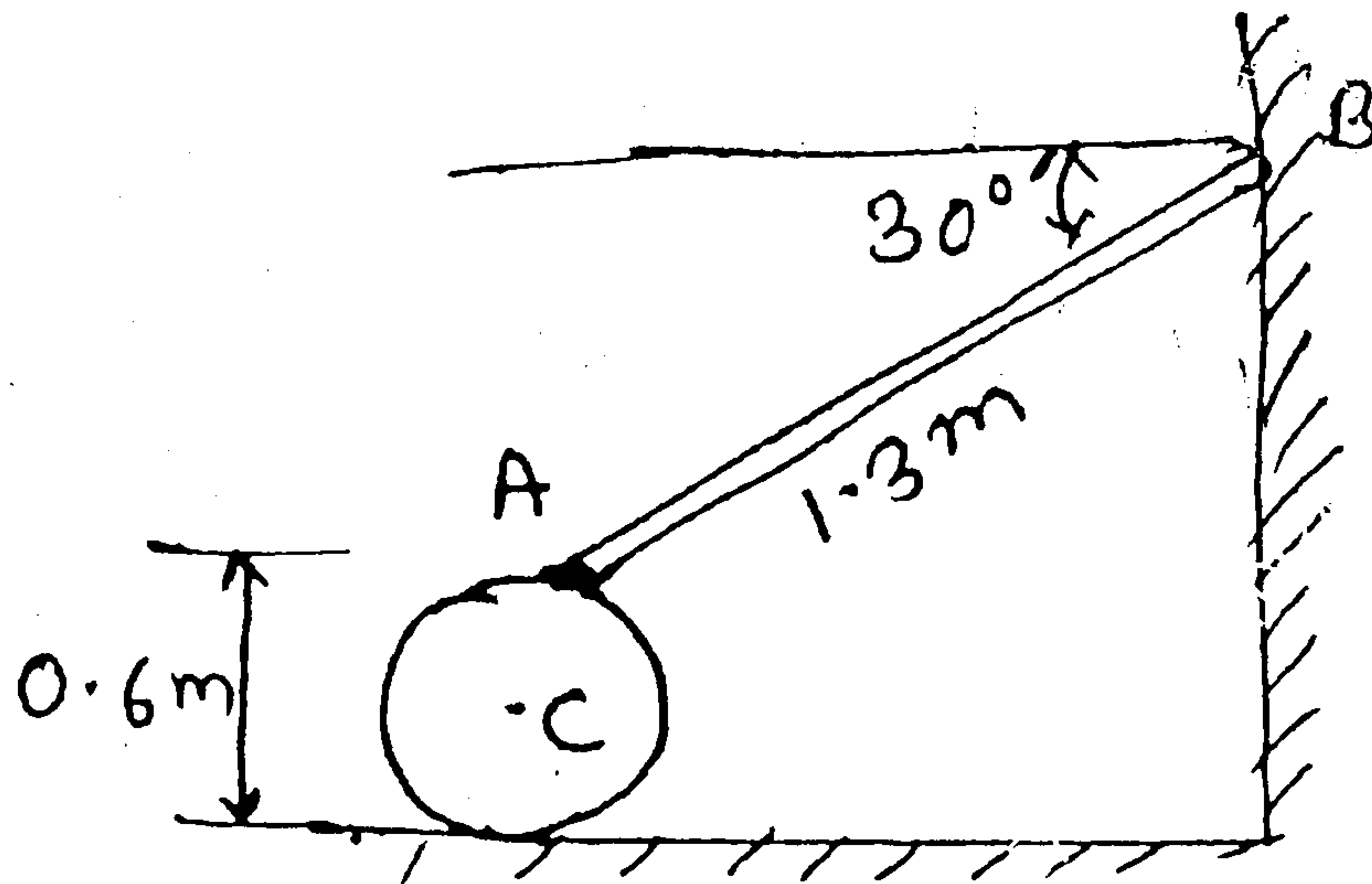
(b) Find the minimum force P applied to the block B which will hold the system in equilibrium.  $\mu = 0.25$  for all surfaces.

6

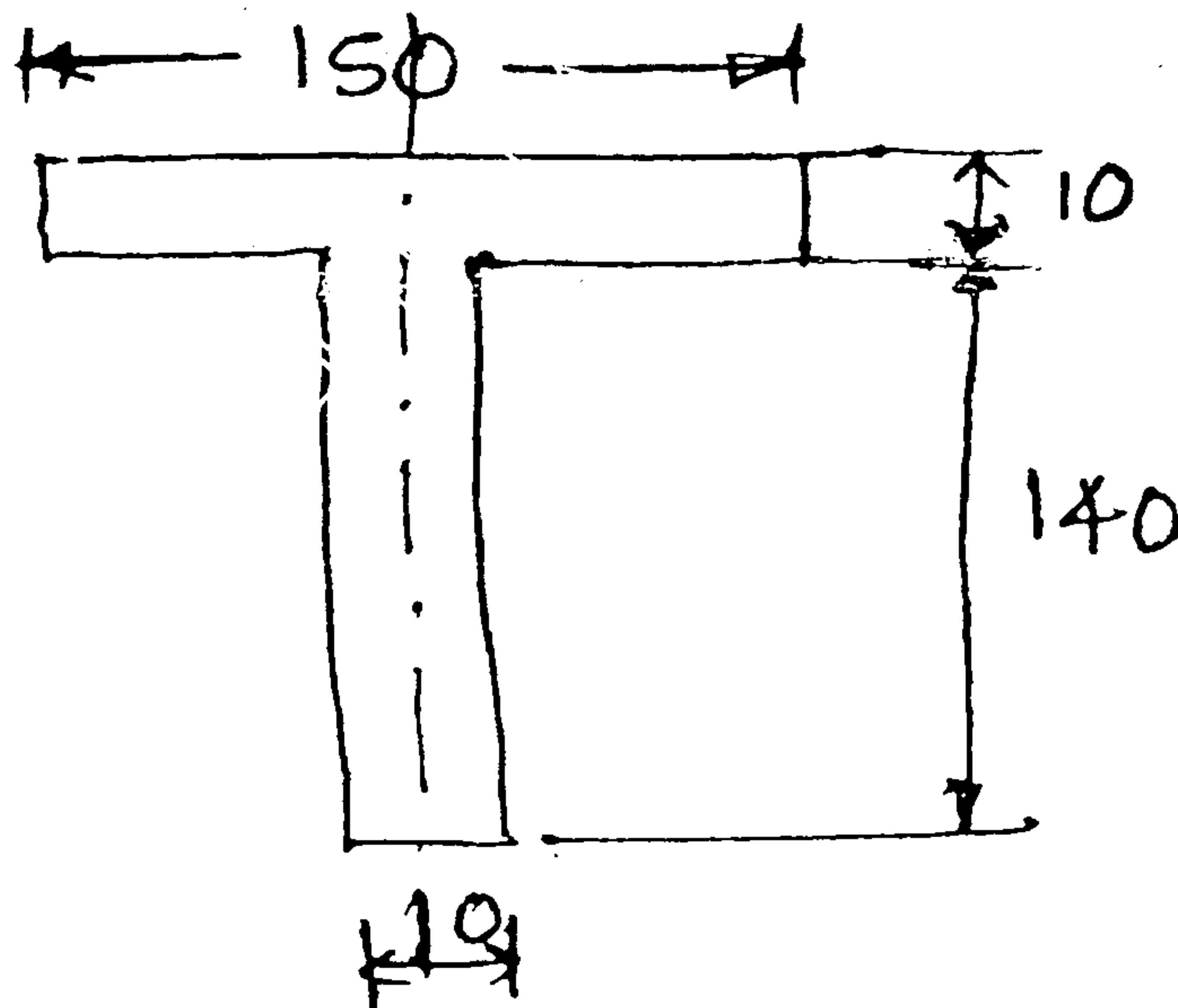


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- (c) 'C' is a uniform cylinder to which rod AB is pinned at 'A' and other end of the rod 'B' is moving along a vertical wall. If the end 'B' of the rod is moving upward along the wall at a speed of 3.3 m/s, find angular velocity of the cylinder assuming cylinder is rolling without slipping. 8

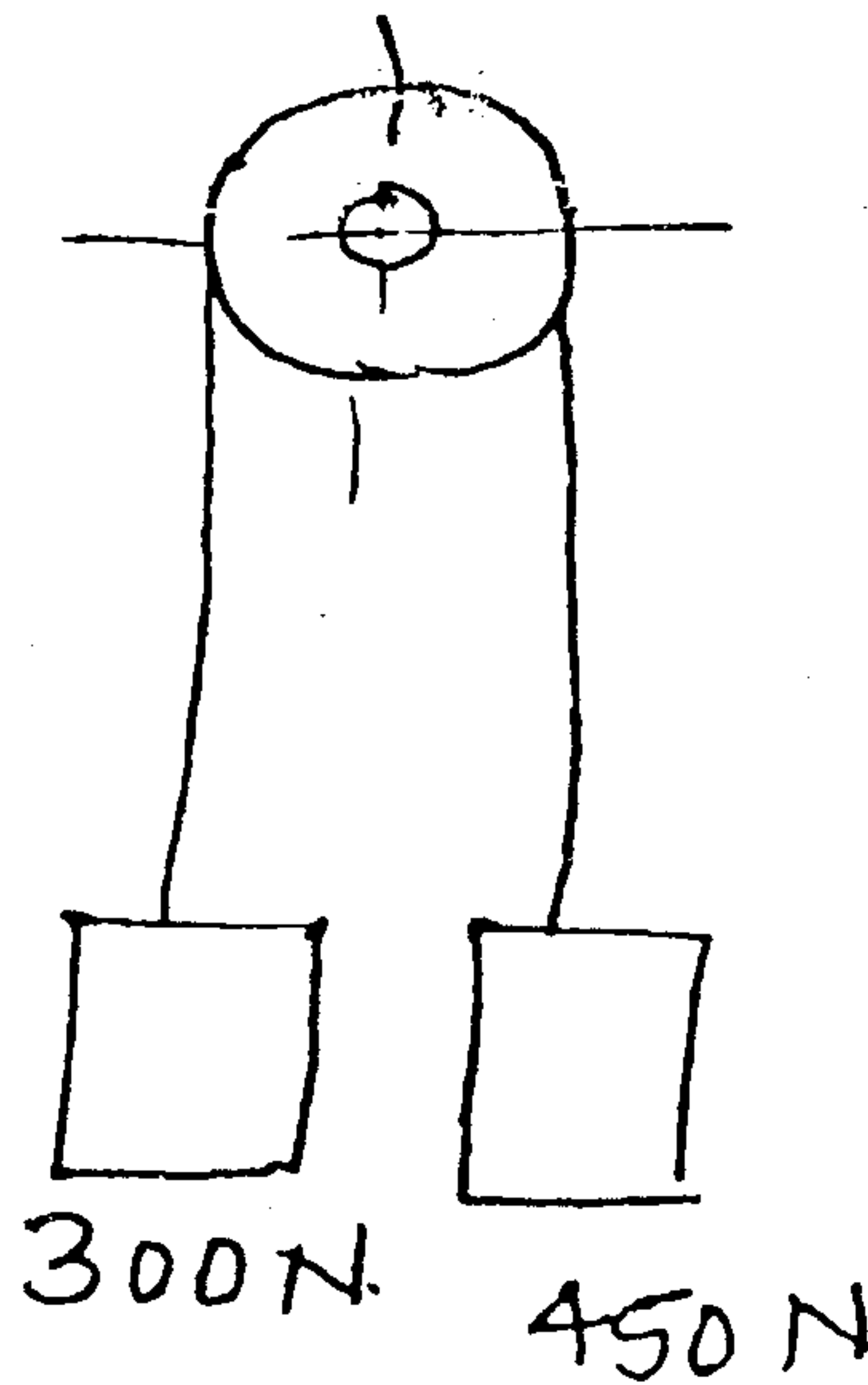


7. (a) Find moment of inertia of the section shown about an axis passing through the centroid and parallel to top most fibre of the section. 6



[ TURN OVER

- (b) Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley as shown. How much distance will the blocks move in increasing the velocity of system from 2 m/sec to 4 m/s? How much is the tension in the string? Use work energy method.



- (c) A ball is dropped from a height of 1 m on a smooth floor. The height of first bounce is 0.810 m Determine.
- Co-efficient of the restitution
  - Expected height of second bound.

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F-E. sem I (OLD) M-14  
Sub- BEEG.

2018/14

(OLD COURSE)

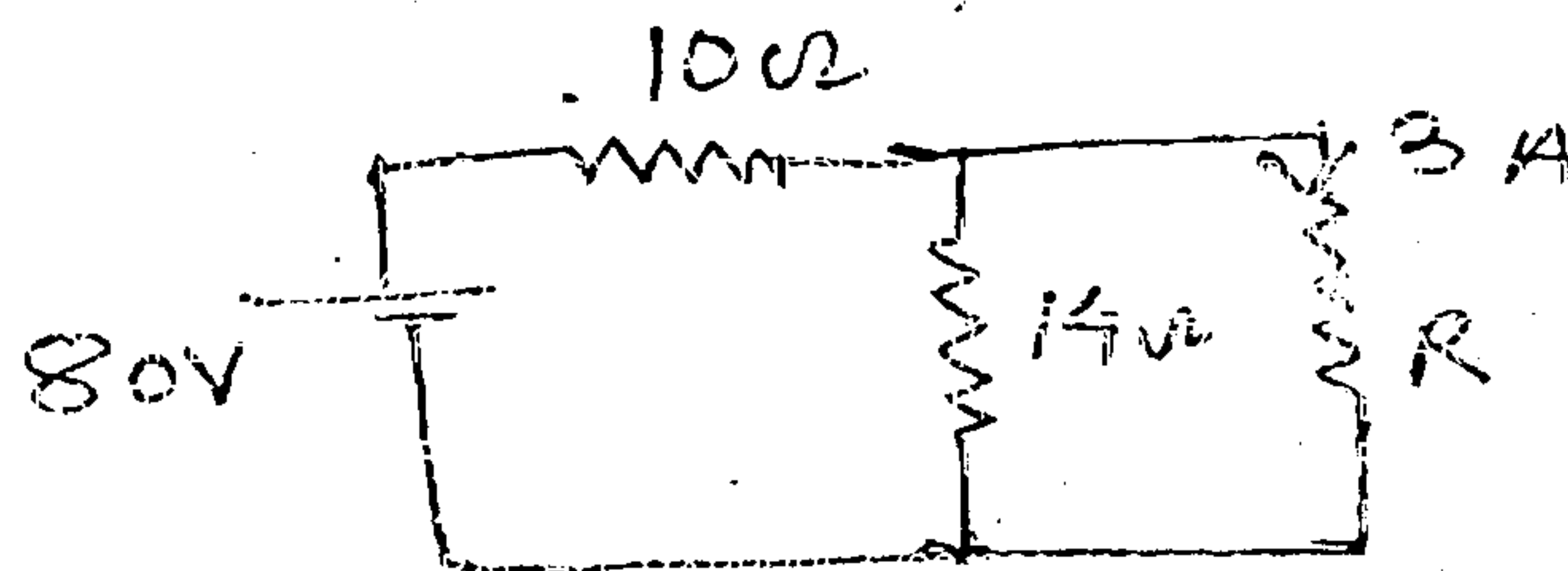
QP Code : MV-17662

(3 Hours)

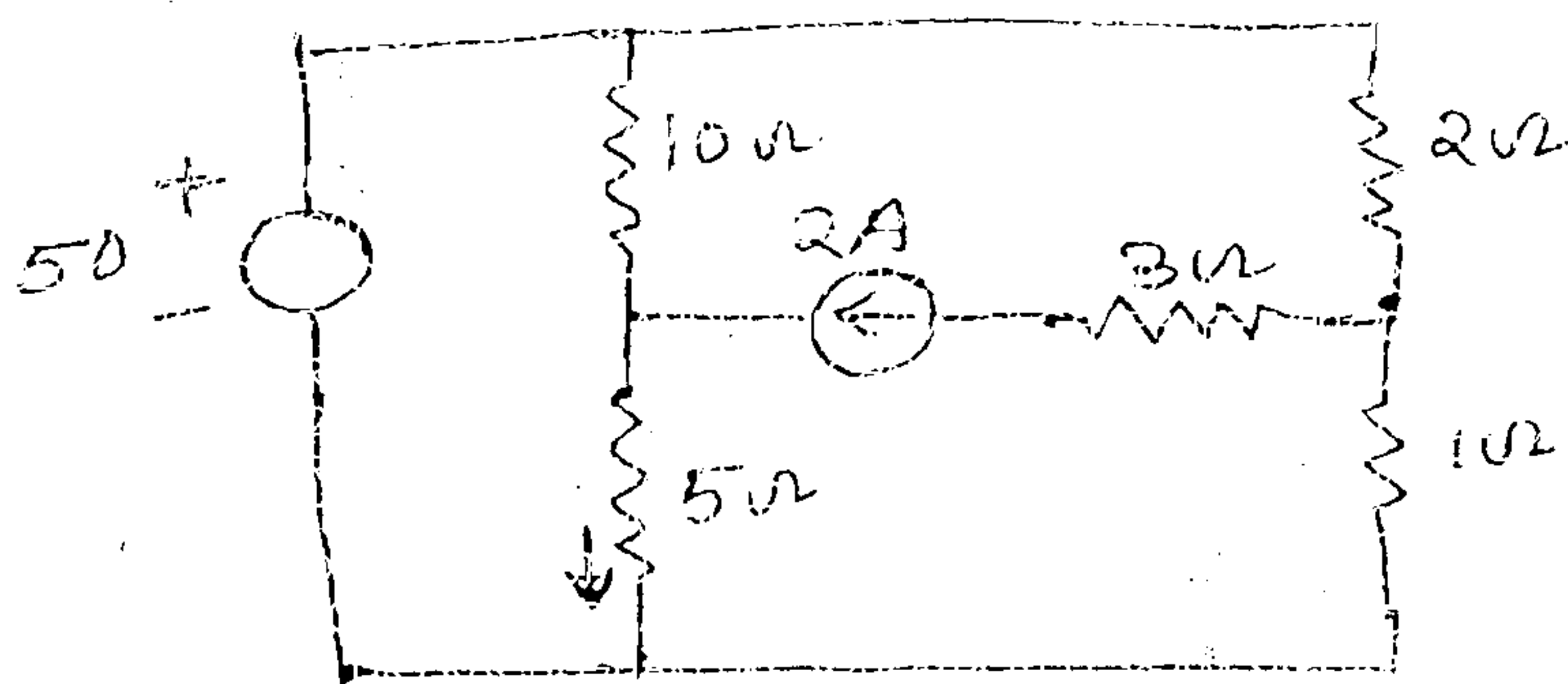
[ Total Marks :100

- N.B. (1) Question no. 1 is compulsory.  
(2) Attempt any four out of remaining six questions.  
(3) Assume suitable data if necessary and justify.

1. (a) Find the value of resistance 'R' such that the current in R is 3A. 3



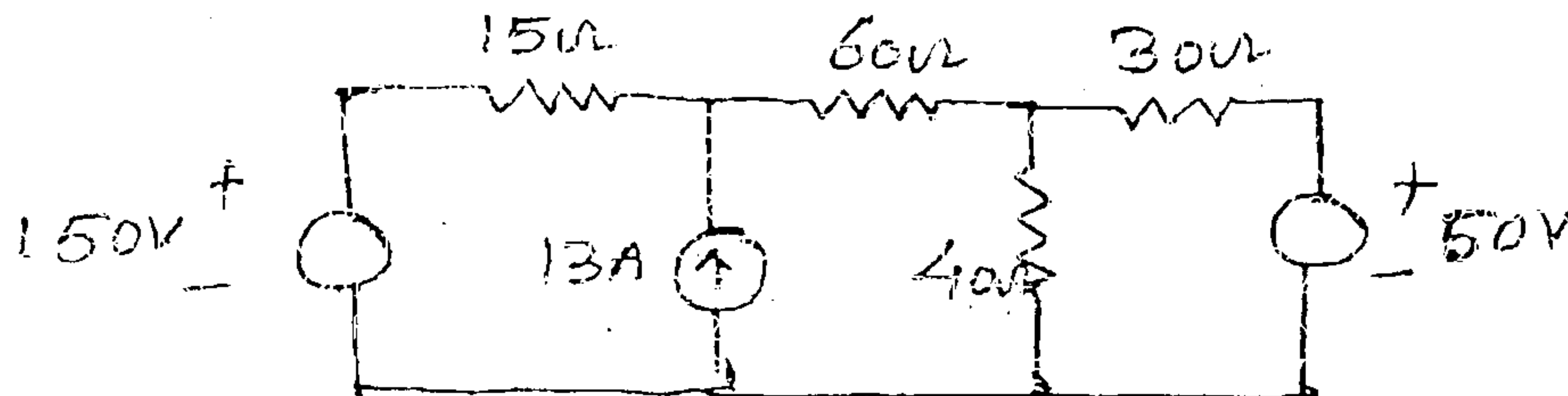
- (b) State and explain superposition theorem. 3  
(c) Show that current in capacitor leads voltage by angle  $90^\circ$ . 2  
(d) Give the condition of series resonance. 3  
(e) Establish the relation between line and phase current in delta connection. 2  
(f) Derive emf equation of single phase transformer. 3  
(g) Differentiate single phase and three phase induction motor. 2  
(h) Explain full wave rectifier. 2
2. (a) By mesh analysis, find the current through  $5\ \Omega$  resistance. 6



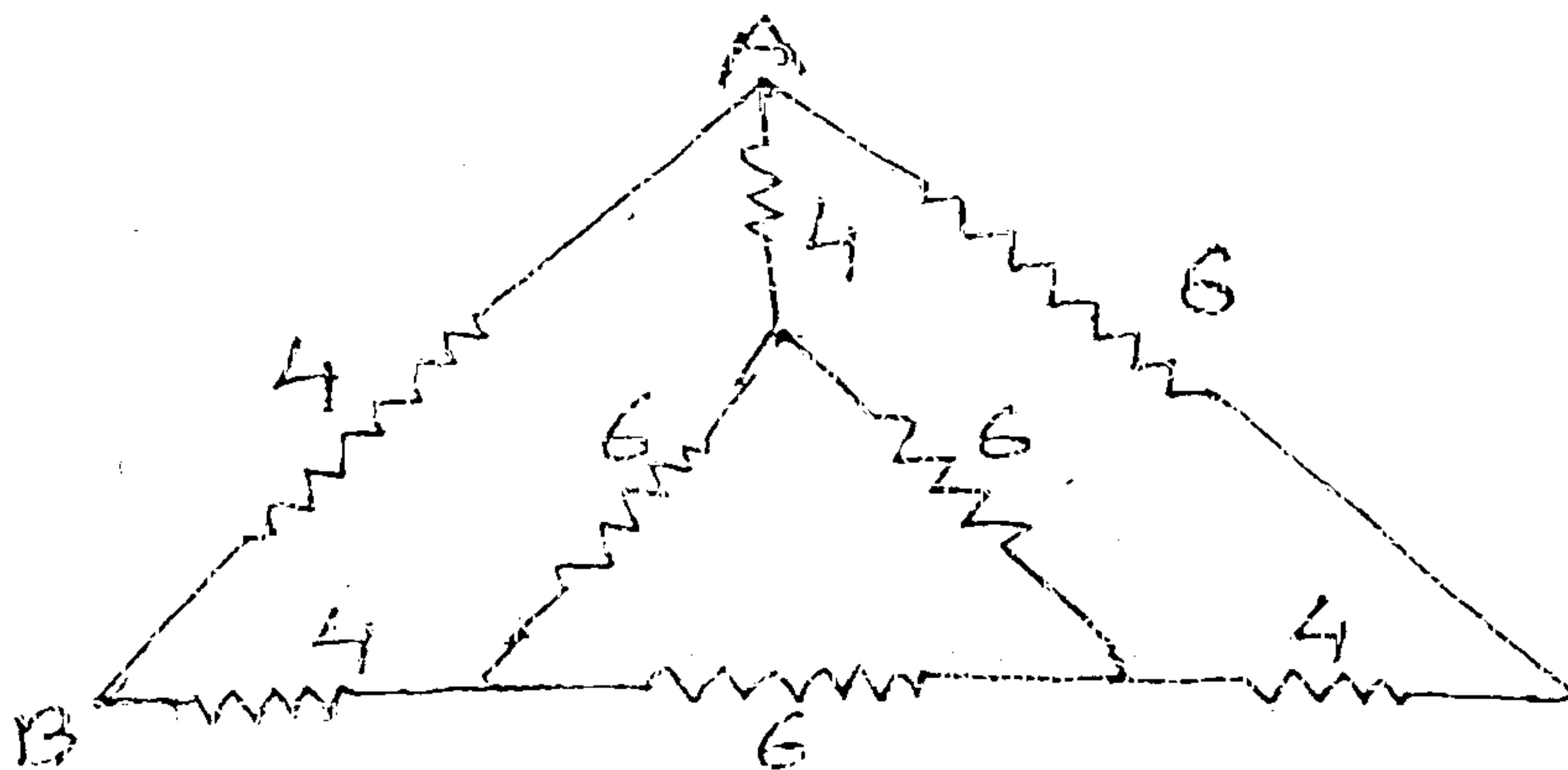
- (b) A coil having a resistance of  $7\ \Omega$  and inductance  $31.8\ \text{mH}$  is connected to  $230\ \text{V}$ ,  $50\ \text{Hz}$  supply. Calculate circuit current, phase angle, and power factor. 6  
(c) A  $230/110\ \text{V}$ ,  $1\ \phi$  transformer has input of  $350\ \text{VA}$  at no load and at rated voltage. The core loss is  $110\ \text{W}$ . Find the iron loss component of no load current and magnetizing component of no load current and no load power factor. 8

[ TURN OVER

3. (a) Explain 2-wattmeter method for the measurement of power in 3  $\phi$  circuit. 8  
 (b) Explain the losses in transformer. 4  
 (c) How the rotating magnetic field is produced in three phase induction motor? 8
4. (a) Determine Thevenin's equivalent circuit and find the current through 30  $\Omega$  resistance. 7



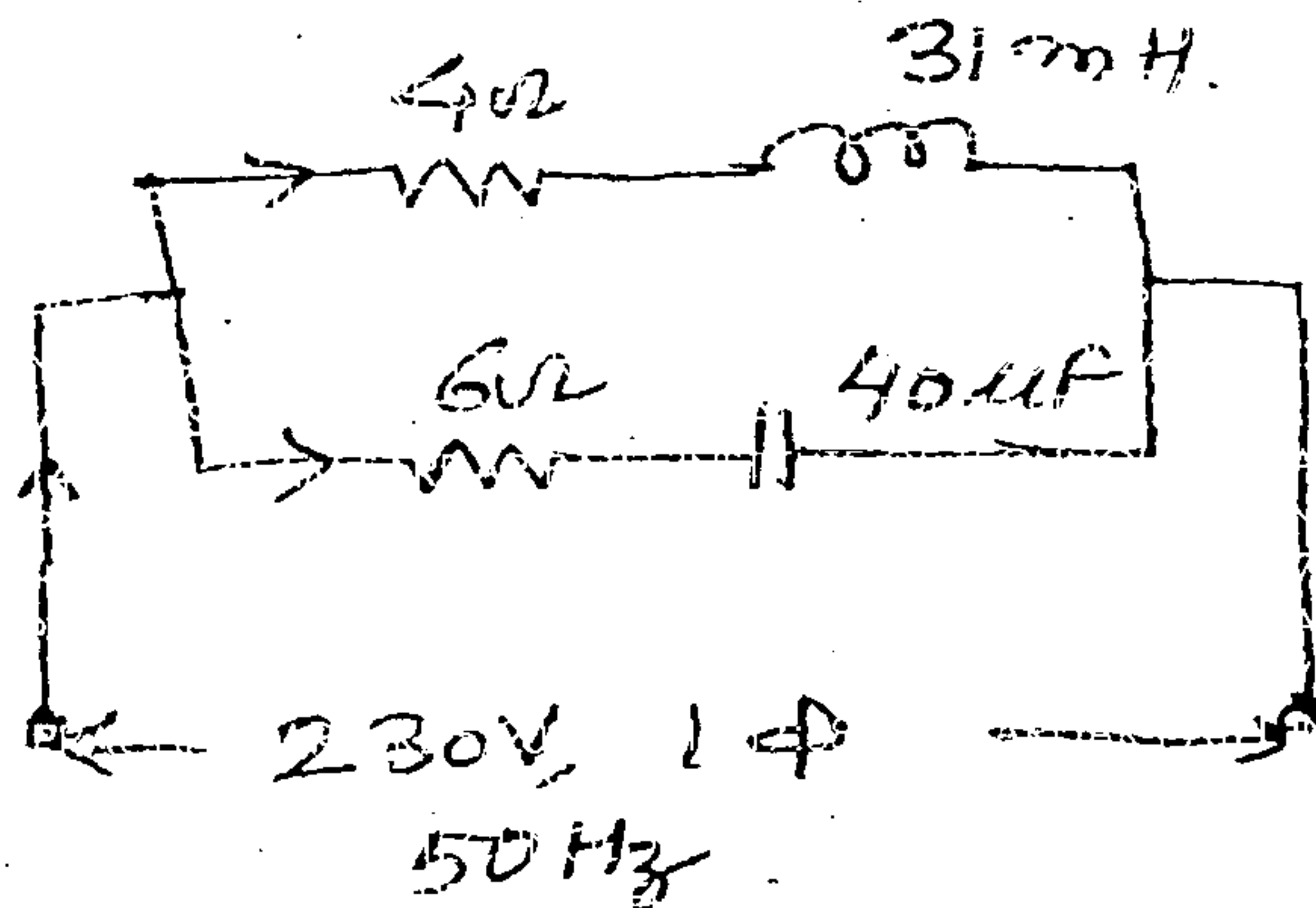
- (b) Explain form factor and peak factor. 4  
 (c) Derive the formula for power in 3  $\phi$  circuit in case of star connection. 4  
 (d) Explain the working of C-filter. 5
5. (a) Find resistance between point A and B. 7



[ TURN OVER

(b) Find the power consumed by the circuit.

5



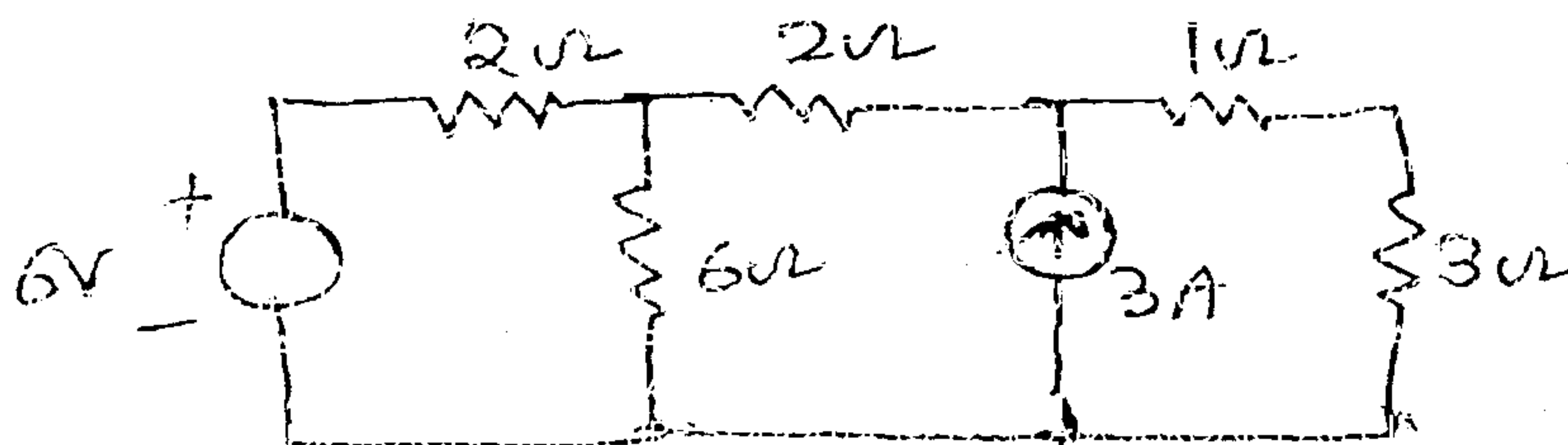
(c) A 50 KVA, 2300/230V, single phase transformer has primary and secondary resistance as  $2 \Omega$  and  $0.02 \Omega$  respectively. The iron loss is 412 W. Calculate the efficiency.

8

- (i) at full load upf.
- (ii) at half load if P.f. is 0.8.

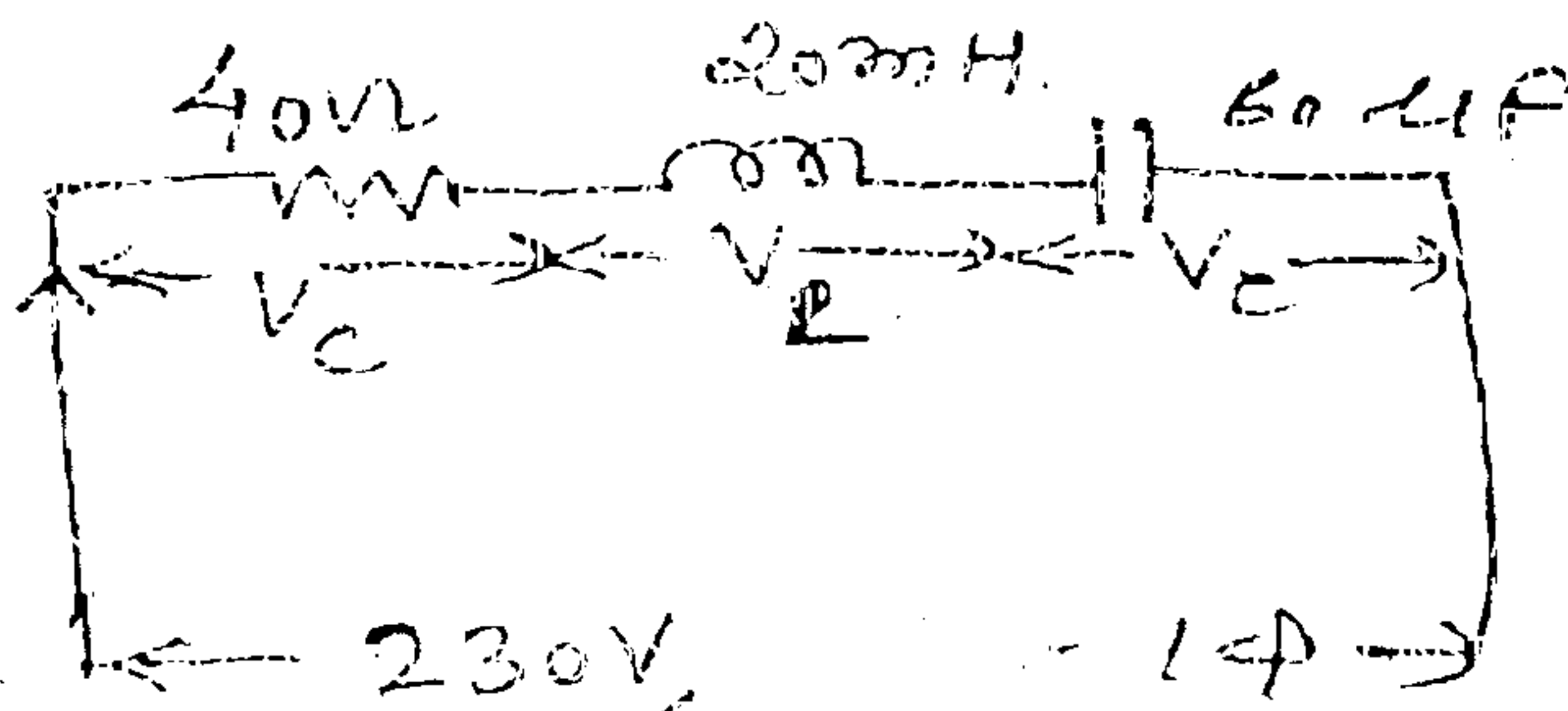
6. (a) Find the current in  $3 \Omega$  resistance by superposition theorem.

7



(b) Find the resonant frequency, current, quality factor and band width for the given circuit.

7



[ TURN OVER

- (c) Three similar coils are connected in star take power of 1.5 KW at 0.2 power factor lagging from  $3\phi$  440V, 50 Hz, supply. Calculate the resistance and inductance of each coil. 6
7. (a) Explain the term leading and lagging power factor. 2
- (b) Find the power consumed in series R-L circuit. 3
- (c) Derive the equivalent circuit of single phase transformer. 5
- (d) Explain why single phase induction motor is not self starting. 5
- (e) Explain the working of n-p-n transistor. 5
-



(OLD COURSE)

QP Code : MV-17654

(3 Hours)

[ Total Marks :100

- N.B.** (1) Question no. 1 is compulsory.  
 (2) Attempt any four questions from Q.no. 2 to Q.no.7.  
 (3) Answer to subquestion should be written together.

1. (a) If  $(1 + \cos\theta + i\sin\theta)(1 + \cos2\theta + i\sin2\theta) = u + iv$  prove that  $u^2 + v^2 = 16\cos^2\frac{\theta}{2}\cos^2\theta$  3  
 (b) If  $y = \sin ax + \cos ax$  then P.T.  
 $y_n = a^n [1 + (-1)^n \sin 2ax]^{1/2}$  3  
 (c) If  $\frac{d\bar{a}}{dt} = \bar{u} \times \bar{a}$ ,  $\bar{u} \times \bar{b} = \frac{d\bar{b}}{dt}$  then S.T.  $\frac{d}{dt}(\bar{a} \times \bar{b}) = \bar{u} \times (\bar{a} \times \bar{b})$  3  
 (d) P.T.  $\cos^2 x = 1 - x^2 + \frac{1}{3}x^4 - \frac{2}{45}x^6 + \dots$  3  
 (e) If  $u = \frac{1}{r}$  where  $r = \sqrt{x^2 + y^2 + z^2}$  then find  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$  4  
 (f) Divide 24 into three parts such that the continued product of the first, square of the second and cube of the third is minimum. 4
2. (a) If  $|z_1 + z_2| = |z_1 - z_2|$ . Show that  $\frac{z_2}{z_1}$  is purely imaginary. 6  
 (b) Separate into real and imaginary parts of  $\cos^{-1}\left(\frac{3i}{4}\right)$  6  
 (c) If  $u = x^n f_1\left(\frac{y}{x}\right) + y^n f_2\left(\frac{x}{y}\right)$  then find  $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} + x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$  8
3. (a) Test whether C.M.V.T. holds for  $f(x) = x^2 + 2$  and  $g(x) = x^3 - 1$  in  $(1, 2)$  and if so find C. 6  
 (b) Find scalars p and q if  
 $(\bar{a} \times \bar{b}) \times \bar{c} = \bar{a} \times (\bar{b} \times \bar{c})$  where  
 $\bar{a} = 2\hat{i} + \hat{j} + p\hat{k}$   
 $\bar{b} = \hat{i} - \hat{j}$   
 $\bar{c} = 4\hat{i} + q\hat{j} + 2\hat{k}$   
 (c) Expand by  $(1 + x + x^2 + x^3)$  in powers of a upto term  $x^8$ . 8

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4. (a) Find roots of  $x^{14} + 127x^7 - 128 = 0$ . 6
- (b) Test the convergence of  $\sum \frac{3^n + 4^n}{4^n + 5^n}$  6
- (c) If,  $y^{1/m} + y^{-1/m} = 2x$  S.T.  $(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0$ . 8
5. (a) Find  $n^{\text{th}}$  derivative of  $y = \frac{x^4}{(x-1)(x-2)}$  6
- (b) Find a and b if  $\lim_{x \rightarrow 0} \frac{x(i + a \cos x) - b \sin x}{x^3} = 1$  6
- (c) Find divergence  $\bar{F}$  and curl  $\bar{F}$  8  
 where  $\bar{F} = \frac{x\hat{i} - y\hat{j}}{x^2 + y^2}$
6. (a) If  $u = f(e^{x-y}, e^{y-z}, e^{z-x})$  find  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$  6
- (b) Find directimal derivativ of  $\phi = 4xz^3 - 3x^2y^2z$  at  $(2, -2, 2)$  in the direction  $\nabla(x^2y^2z^2)$  at  $(1, -1, 1)$ . 6
- (c) Show that 8
- $$\tan^{-1}(e^{i\theta}) = \left(\frac{n\pi}{2} + \frac{\pi}{4}\right) - \frac{i}{2} \log \left[ \tan \left( \frac{\pi}{4} - \frac{\theta}{2} \right) \right]$$
7. (a) If  $u = t^n e^{-t^2/4}$ , then find the value of n so that  $\frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial u}{\partial r} \right) = \frac{\partial u}{\partial t}$  6
- (b) Using theory of approximation find approximate value of  $f(3, 4) - f(2.9, 4.1)$  6  
 where  $f(x, y) = (50 - x^2 - y^2)^{1/4}$
- (c) If  $i^{i \cdot i^{\infty}} = z$  where  $z = x + iy$  prove that  $|z|^2 = e^{-(4n+1)\pi y}$  8

F.E. Sem I (Old) - 5/6/14.  
App. Chemistry - I.

QP Code : MV-17678

(OLD COURSE)

(2 Hours)

[ Total Marks : 75

- N. B. : (1) Question No. 1 is compulsory.  
(2) Attempt any four questions from remaining six questions.  
(3) Figures to the right indicate full marks.  
[At. Wt.: H = 1, C = 12, O = 16, S = 32, Mg = 24,  
Ca = 40, Cl = 35.5]

1. Solve any five. 15
- (a) Calculate the acid value of an oil which required 2.5 ml of 0.01 N KOH.  
(Density of oil is 0.91)
- (b) Write a note on Hydropower.
- (c) Define COD & BOD. Give their significance.
- (d) Write a note on fullerene.
- (e) Write a note on thermosetting plastics.
- (f) Give the limitations of Gibb's phase rule.
- (g) Write a note on blended oil.
2. (a) Calculate the amount of lime (90% pure) and soda (80% pure) needed to soften 50,000 liters of water having following analysis. 6  
CaCl<sub>2</sub> = 80 ppm, CaCO<sub>3</sub> = 100 ppm, Mg(HCO<sub>3</sub>)<sub>2</sub> = 14.6 ppm,  
MgSO<sub>4</sub> = 85 ppm, SiO<sub>2</sub> = 100 ppm.
- (b) What is the fabrication of plastics? Explain transfer moulding. 5
- (c) Describe the working of photovoltaic cell. 4
3. (a) Give the preparation, properties & uses of the following. 6  
(i) PMMA (ii) Polyethylene
- (b) Describe Hydrodynamic lubrication in detail. 5
- (c) Explain the laser ablation method of preparation of CNTs. 4
4. (a) (i) Define Viscosity and Viscosity index. Give their significance. 3  
(ii) Find the saponification value of an oil whose 4 gms required 12 ml of 0.5 N KOH for complete saponification. 3
- (b) Describe water system with the help of phase diagram. 5
- (c) Describe reverse osmosis method for the purification of water. 4
5. (a) Describe the various terms involved with two examples each in Gibb's phase rule. 6

[ TURN OVER

- (b) Describe the zeolite method for softening of hard water. 5
- (c) Give the preparation, properties and uses of Urea formaldehyde. 4
6. (a) What are SWCNT and MWCNT. Describe the various applications of nanomaterials. 6
- (b) Calculate the each type of hardness of water whose 50 ml required 30 ml of 50 ml of standard hard water containing 1 gm/lit  $\text{CaCO}_3$  eq. hardness required 35 ml of EDTA. 45 ml of boiled hard water then consumed 6 ml of the same EDTA. 5
- (c) Describe Ni-Hydrogen battery. 4
7. (a) What are the various drawbacks of natural rubber? Describe Vulcanisation process to overcome them. 6
- (b) Describe the activated sludge method of sewage treatment. 5
- (d) Describe plain carbon steels. 4
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