

PILLAI COLLEGE OF ENGINEERING, NEW PANVEL

(Autonomous) (Accredited 'A+' by NAAC)

END SEMESTER EXAMINATION

SECOND HALF 2021(Supplementary)

SEM-I

Branch:- FE(COMP/IT)

Subject: Engineering Mechanics & Graphics

Time: 03.00 Hours

Max. Marks: 60

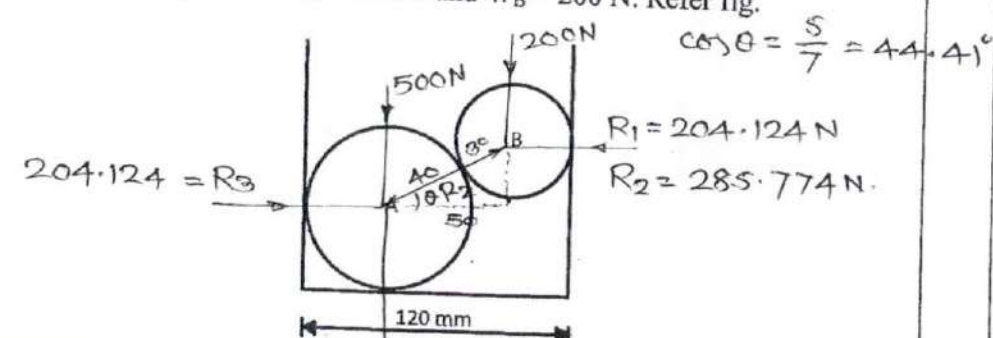
Date: 03-06-2022

Section A: Engineering Mechanics

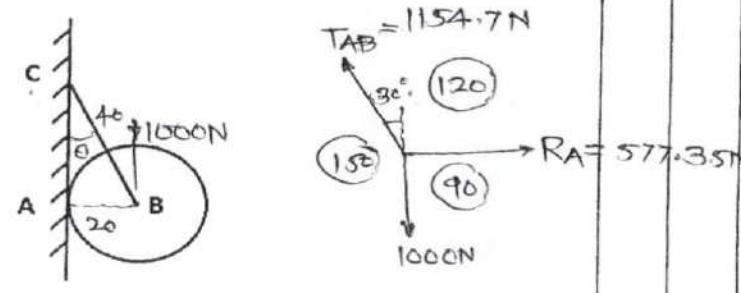
CE108.IT110

Attempt any two :

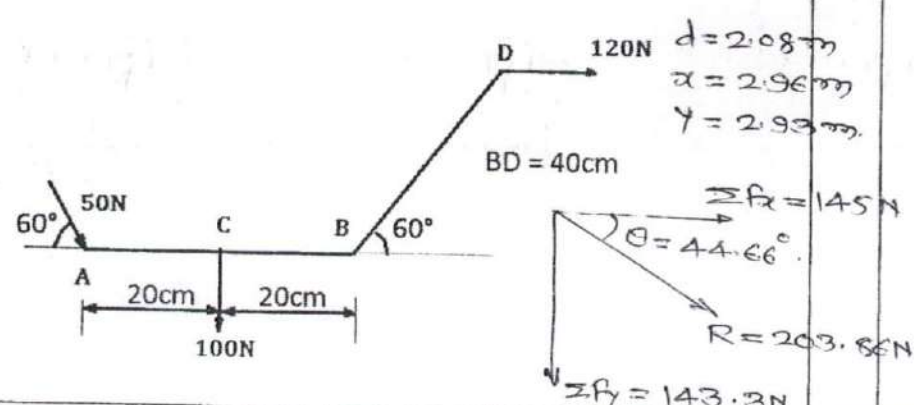
Q.1.	Attempt all	M	BT	CO
a)	<p>Two tugboats are towing a cargo ship as shown below. Tugboat A exerts a force of 15 kN at a 30° angle while tugboat B exerts a force of 20kN at a 50° angle. Determine the magnitude and direction of the resultant force acting on the cargo ship.</p> $R = \sqrt{15^2 + 20^2 + 2 \times 15 \times 20 \times \cos 80}$ $= 27.003 \text{ kN}$ $\theta = \tan^{-1} \left(\frac{20 \sin 80}{15 + 20 \cos 80} \right)$ $= 46.83^\circ$ $\theta - 30 = 16.83^\circ$	4	4,5	CO1
b)	<p>A roller of weight 500N has a radius of 120mm and is pulled over a step of height 60mm by a horizontal force P. Find magnitude of P to just start the roller over the step.</p> $\alpha = \sin^{-1} \left(\frac{6}{12} \right)$ $= 30^\circ$ $P = 288.67 \text{ kN}$ $R_B = 577.35 \text{ kN}$	5	4,5	CO3
c)	<p>Determine the reactions at all the supports of the beam shown in Fig.</p>	6	4,5	CO2, CO3
Q.2.	Attempt all			
a)	<p>Determine the magnitude of the resultant of parallel force system shown in fig.</p> $R = -110 \text{ N} \text{ (down)}$ $M_O^R = 660 \text{ N} \cdot \text{m} \text{ (clockwise)}$ $\therefore x = 6 \text{ m}$	4	4,5	CO1

b)	During a test a car moves in a straight line such that its velocity is defined by $v=0.3(9t^2 + 2t)$ m/s, where 't' is in seconds. Determine the position and acceleration when $t=3$ sec. Take at $t=0, x=0$.	5	4,5	CO1
c)	Two spheres A and B are kept in a horizontal channel. Determine the reactions coming from all contact surfaces. Consider the radius of A and B is 40mm and 30mm respectively. Take $W_A = 500$ N and $W_B = 200$ N. Refer fig. 	6	4,5	CO2, CO3

Q.3. Attempt all

a)	A cylinder B, $W_b=1000$ N, dia. 40 cm, hangs by a cable AB= 40 cm against a smooth wall. Find out reaction at C and T_{AB} . Refer fig. $\theta = \sin^{-1}(\frac{2}{4}) = 30^\circ$ 	4	4,5	CO2, CO3
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b)	Motion of particle along straight line is defined by $v^3 = 64 s^2$ where v is in m/sec and s is in m. Determine: i. Velocity when distance covered is 4m. ii. Acceleration when distance covered is 18m. $v _{s=4} = 10.08$ m/s $\frac{dv}{ds} \cdot 3v^2 = 64 \cdot 2s \cdot \frac{ds}{dt}$ $3v^2 \cdot a = 128 \cdot s \cdot v$ $v _{s=18} = 27.47$ m/s $a _{s=18} = 27.95$ m/s ²	5	4,5	CO1
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c)	Find the resultant of the forces and locate it about point B. 	6	4,5	CO1
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$v = 0.3(9t^2 + 2t) \dots \text{int}$
 $a = 0.3(18t + 2)$
 $a|_{t=3} = 16.8 \text{ m/s}^2$
 $x = 0.3(9\frac{t^3}{3} + \frac{2t^2}{2} + c)$
 $x = 0.3(3t^3 + t^2 + c)$
 at $t=0, x=0 \therefore c=0$
 $x = 0.3(3t^3 + t^2)$
 $x|_{t=3} = 27 \text{ m}$

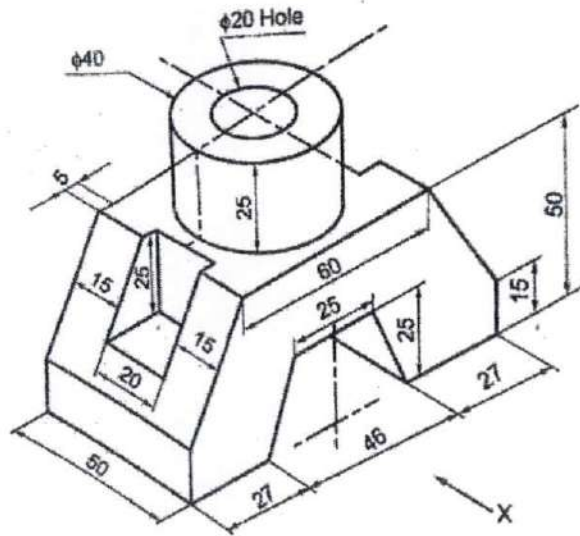
Section B: Engineering Graphics

Attempt any two :

Q.1. Attempt all

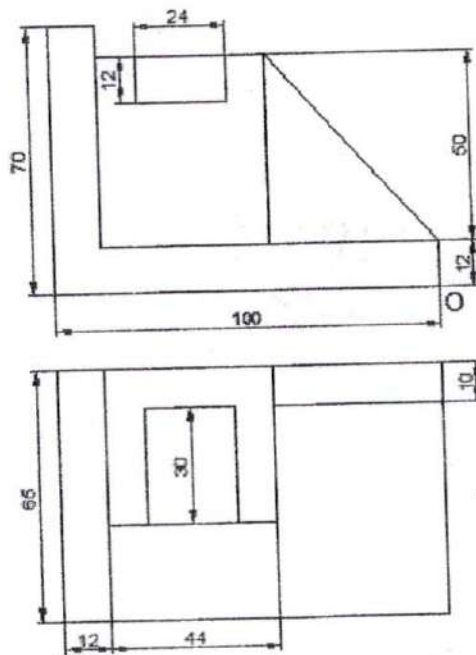
M	BT	CO
9	4	CO5

- a) Using the first angle method of projection draw the following views-
- Front view in the direction of arrow X
 - Top View

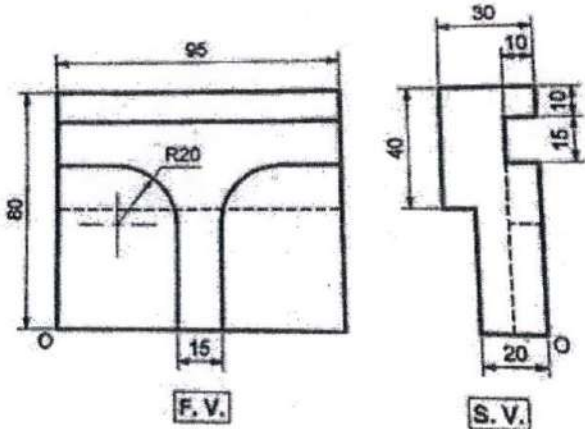
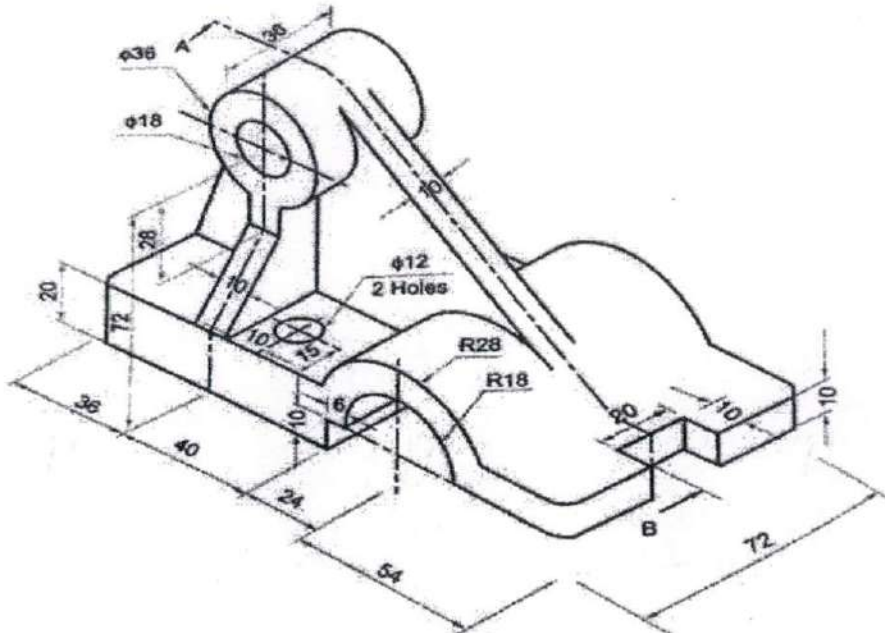


- b) Draw isometric projections using natural scale.

6	4,5	CO6
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P.T.O.

Q.2.	Attempt all			
a)	Draw isometric projections using natural scale 	9	4,5	CO6
b)	A line AB 100 mm long makes an angle of 30° with HP, 45° with VP. Its end A is 20 mm above HP and 30 mm in front of VP. Draw FV and TV of the line and find its inclination with XY line, if its end B is in I st Quadrant.	6	4,5	CO4
Q.3.	Draw : a) Sectional F.V. (along A-A) b) T.V. c) R.H. S.V. 	15	4	CO5

CO1- To verify the law of moments and draw a Free Body Diagram and label the reactions on it.

CO2- To determine the centroid and MI of plane lamina.

CO3- To apply equilibrium equations in statics.

CO4- To Apply the basic principles of projections in Projection of Lines

CO5- To Apply the basic principles of projections in reading and converting 3D view to 2D drawing.

CO6- To Visualize an object from the given two views.

M-Marks, BT- Bloom's Taxonomy, CO-Course Outcomes.

