K Education Centre

AS Revision

Forces Equilibrium and Moments

Marking scheme

Forces , Equilibrium and Moments Marking scheme

	Guidance / Answers	Marks
Q1 :	5 N , (third force)^2= 3^2+4^2	2
Q2 :	a) 3.22 km , as distance^2 = 2.8^2+1.6^2 b) 60.3 degrees , Taking the angle turned as $\tan^{-1}$ (2.8/1.6)	2 2
Q3 :	a) Refer to free body diagram of object on slope . b) Frictional force = 8 sin 45 = 5.65 N Support force = 8 cos 45 = 5.65 N	6
Q4:	i) Horizontal component = T cos 42 = 800 cos42 = 594.5 N Vertical component = T sin 42 = 800 sin42 = 535.30 N ii) Weight = T sin 42 + Tsin42 = 2 T sin 42 = 1070.6 N	6
Q5 :	T_1sin 53 = T_2 sin 37 T_2 = T_1 sin53/sin37 hence T_1 cos53 + T1 sin53 cos37/sin37= 12 000 T_1 = 7200 N T_2 = 7221 sin53/sin37 = 9600 N	5
Q6 :	T cos 75 + Tcos 75 = 90 2 T cos 75 = 90 T = 174 N	4
Q7 :	Taking clock wise and anti clock wise moments (w+0.5)x0.15 = 0.6x2.5+0.35x1.5 W = 13 N	2
Q8 :	Taking moment from 1 meter end and assuming the support to be S_y on 0.5 meter end 8.5 x S_y = 230 x 4 ; S_y = 108 N	4

	Thus moment on 0.5 meter end = 108 N Using same logic moment on 1 meter end = 122 N	
Q 9 :	a) A single point where you consider the whole weight of the object to act from. b) When tilted by 5 degrees , the weight's line of action still passes through cylinder base. As a result cylinder produced a clockwise turning force about the point where cylinder is in contact with the floor. which pulls cylinder back to its base. c) Maximum angle $\tan \emptyset = 5/6$ $\emptyset = 40$ degrees	6
Q10 :	Friction is the component weight parallel to slope $F_{max} = W \sin\emptyset$ Reaction force , $R = W \cos \emptyset$; Fmax = μ x R ; $W \sin \emptyset = \mu \times W \cos\emptyset$; $\mu = \sin \emptyset / \cos \emptyset = \tan \emptyset$	4
Q11 :	Taking moment at first pillar and assuming w to be weight of the horizontal span: $1600 \times 10^3 \times 14 = 380 \times 10^3 \times 7 + w \times 7$; w = 2820 kN	4