Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technology College	
Department	Surveying and Road Construction Department/ Road Construction Branch	
Module Name	ENGINEERING MECHANICS	
Module Code	ENM 203	
Degree	Technical Diploma [X] Bachelor [ ] High Diploma [ ] Master [ ] PhD [ ]	
Semester	Semester 2	
Qualification	Ph.D. in Civil/Environmental Engineering	
Scientific Title	Assistant Professor	
ECTS (Credits)	6	
Module type	Prerequisite [ ] Core [X] Assist. [ ]	
Weekly hours	4 hrs.	
Weekly hours (Theory)	(2)hr Class	(2)Total hrs Workload
Weekly hours (Practical)	( )hr Class	(161)Total hrs Workload
Number of Weeks	16	
Lecturer (Theory)	/	
E-Mail & Mobile NO.	/	
Lecturer (Practical)	Dr.Abdulfattah Ahmad Amin	
E-Mail & Mobile NO.	abdulfattah.amin@epu.edu.iq	
Websites	/	

Corse Description	The design of this module includes establishing improving the student's knowledge and understanding about the engineering mechanics to provide the student realistic applications encountered in professional practice. The topics of this module includes: basic concepts of engineering mechanics, forces systems and a force analysing, drawing of free body diagrams and determine the resultant of forces and/or moments. Draw complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram. Determine the support reactions on a structure. Determine the connection forces in trusses and in general frame structures. Determine the centroid. Analyse statically determinate planar frames. The module will be delivered via lectures and tutorials (supported by problem-solving classes
Course objectives	**The general objectives of this module are:** - Understand the theory of engineering mechanics to tackle real live engineering problems - Apply principles of statics to solve engineering problems. - Involve in team working and collaborate with colleagues.
Student's obligation	To pass this module the students should attend all lectures and complete all tests, exams and assignments.
Required Learning Materials	Forms of teaching Oral presentations lectures, Group discussions, Seminars, Problem-solving based learning, Project based learning

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review		/		
Assignments	Homework	10	1-12	Improve to solving problems
	Class Activity	6	1-12	To analyze and solve engineering mechanics problems
	Report	8		To learn how to write technical reports

		Seminar	8	1-12	Improve the ability of presentation
		Essay	/		
		Project	/	1-12	
	Quiz		8	1-12	
	Lab.		/		
	Midterm Exam		20	1-12	
	Final Exam		40	1-12	
	Total		100		
Specific learning outcome:	*On successful completion of this module the learner will be able to:* 1. **Recognize** basic concepts of engineering mechanics 2. **Identify** quantify all types of forces systems and **analyze** forces into components 3. **Determine** and **apply** concepts of moment of forces and couples 4. **Develop** and **sketch** free body diagrams for different structures and elements of structures 5. **Determine** resultants and **apply** conditions of static equilibrium to plane force systems 6. **Analyze** frames and trusses using equilibrium equations. 7. **Apply** concepts of first moment of area and **locate** centroid of different types areas 8. **Collaborate** with others to solve problems by group or team working.				
Course References:	- Lecture notes. - R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press, 2006. - Hibbler, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010). - Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi (2008)				

Course topics (Theory)	Week	Learning Outcome
Introduction	Week 1	***1***
Forces Systems	Week 2	***1 , 2 and 8***
Moment of forces	Week 3	***3 and 8***
Couples	Week 4	***3***
Equilibrium of rigid bodies- Conditions and Free body diagram (F.B.D)	Week 5	***1,2, 4 and 8***
Equations of Equilibrium- Two forces members	Week 6	***2, 3 , 4 and 5***
Midterm Examination	**Week 7**	
Midterm Examination	Week 8	
Equations of Equilibrium- Three forces members	Week 9	***4 , 5 and 6***
Equations of Equilibrium- Three forces members	Week 10	***5, 6 and 8***
Distributed loads	Week 11	***4 , 8***
Trusses- Joints method	Week 12	***4, 5 and 6***
Trusses- Sections Method	Week 13	***4, 5 and 6***
Centroid	Week 14	***2, 7 and 8***
Final Examination	Week 15	
Final Examination	Week 16	
Practical Topics	**Week**	**Learning Outcome**
N.A		

- **Examinations (question design):** **The following is an example of the examination and its answer:**		

Ministry of Higher Education & Scientific Research
Erbil Polytechnic University
Erbil Technology Institute
Road Construction Department

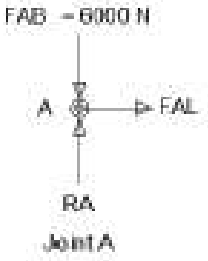
Academic year: 2017 – 2018
Final Examination – 1st Attempt

Class: First Year
Subject: Engineering Mechanics
Time: 3 hrs
Date: 3 / 6 /2018
Code:

Questions and Typical Answers الأجوبة النموذجية

Q1/ Determine the force (P) and the force in member FG of the pin-connected truss shown below, when the force in member AB is 6000 N compression. **(20 Mark)**

Solution

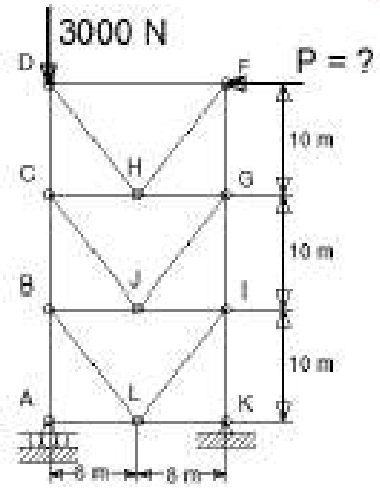


Joint A:

$\sum F_y = 0 +\uparrow$

$R_A - 6000 = 0$

$R_A = 6000\ N\ \uparrow$



From F.B.D. of whole truss

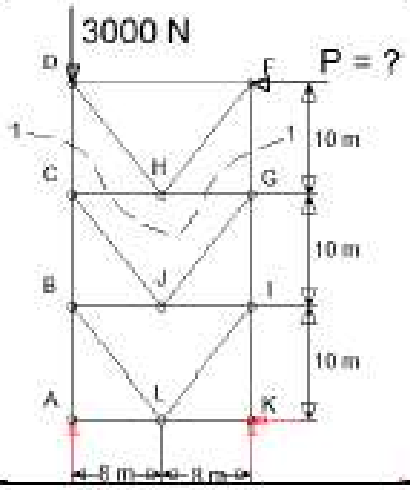
$\sum M_K{}^{+\circlearrowleft} = 0$

$R_A \times 16 - 3000 \times 16 - P \times 30 = 0$

$6000 \times 16 - 3000 \times 16 - P \times 30 = 0$

$6000 \times 16 - 3000 \times 16 = P \times 30 \Rightarrow$

$P = 1600\ N \leftarrow$



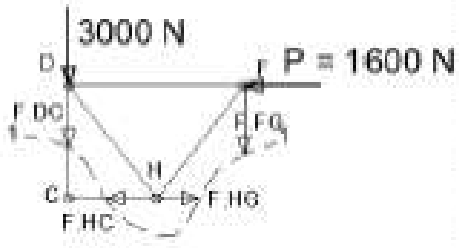
section 1 – 1

$\sum M_C{}^{+\circlearrowleft} = 0$

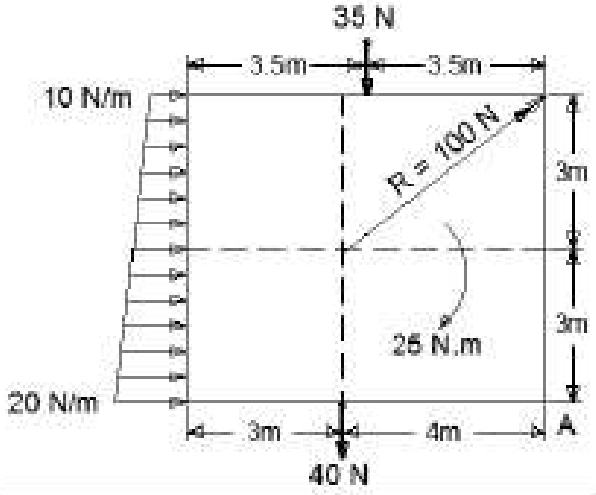
$F_{FG} \times 16 - 1600 \times 10 = 0$

$F_{FG} = \frac{16000}{16}$

$= 1000\ N\ T$



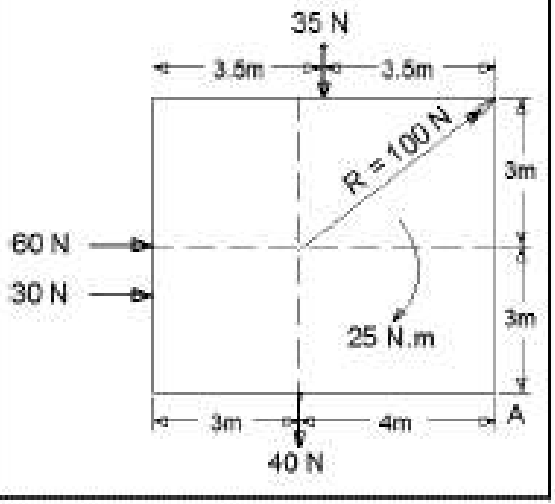
Q2/ For Figure shown below, the 100 N force is a resultant of the couple (25 N.m) and the forces shown in the figure as well as an unknown force. Determine the unknown force and its location with respect to point A. **(20 Mark)**



Solution:

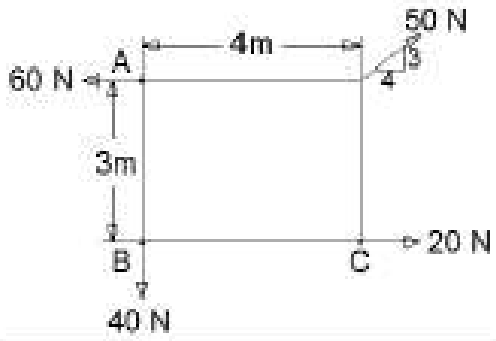
$$R_x = \sum F_x \; +\rightarrow$$
$$100 \times \frac{4}{5} = 60 + 30 + F_x$$
$$80 = 90 + F_x$$
$$F_x = 80 - 90$$
$$F_x = -10\ N \;\Rightarrow\; F_x = 10\ N \leftarrow$$

$$R_y = \sum F_y \; +\uparrow$$
$$100 \times \frac{3}{5} = -35 - 40 + F_y$$
$$60 + 35 + 40 = F_y \Rightarrow F_y = 135\ N \uparrow$$



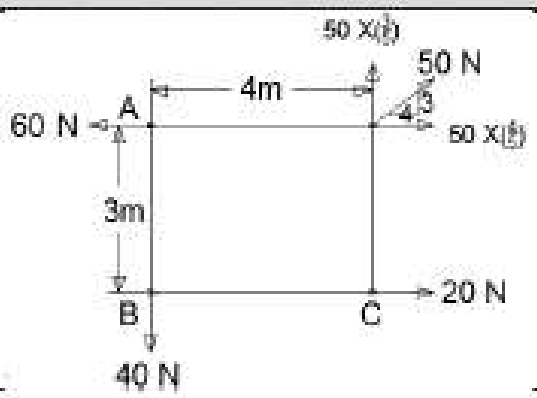
$$F = \sqrt{(10)^2 + (135)^2}$$
$$F = 135.37\ N \nwarrow$$
$$\theta = \tan^{-1}\left(\frac{135}{10}\right) = 85.76^{\circ}$$
$$M_A^{R+\circlearrowleft} = \sum M_A^{F+\circlearrowleft}$$
$$100 \times \frac{4}{5} \times 3 + 100 \times \frac{3}{5} \times 4 = -35 \times 3.5 - 40 \times 4 + 60 \times 3 + 30 \times 2 + 25 + 135.37 \times d_A$$
$$240 + 240 = -122.5 - 160 + 180 + 60 + 25 + 130.38 \times d_A$$
$$480 + 17.5 = 135.37 \times d_A \Rightarrow d_A = \frac{497.5}{135.37} = 3.68\ m$$

Q4/ Determine the moment for the forces system shown with respect to point A, B and C. **(20 Mark)**



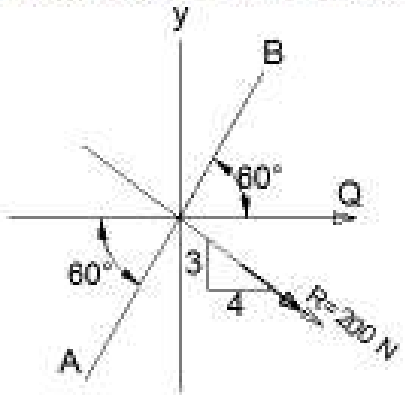
Solution:

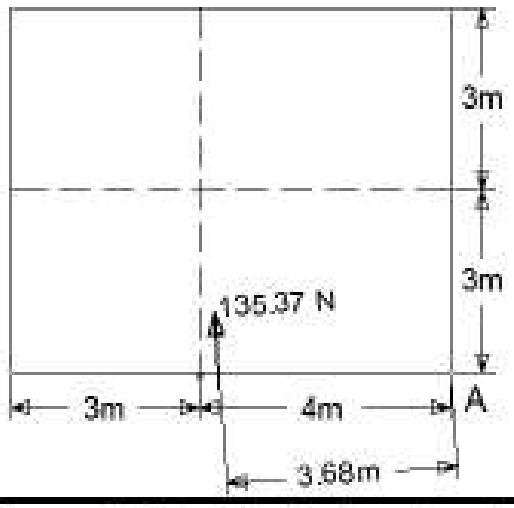
$$\sum M_A{}^{+\circlearrowleft} = -30 \times 4 - 20 \times 3$$
$$= -180\ \text{N.m}^{+\circlearrowleft}$$
$$= 180\ \text{N.m}^{\circlearrowleft}$$



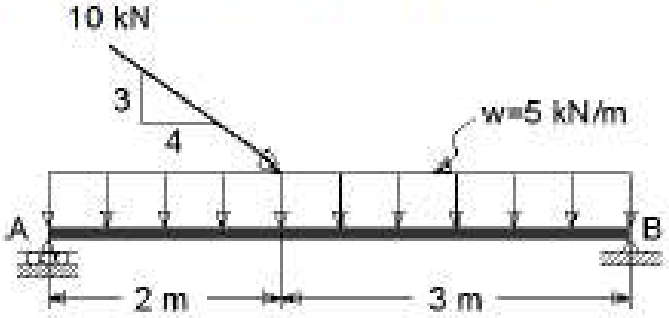
$$\sum M_B{}^{+\circlearrowleft} = -60 \times 3 \quad \underline{(\text{or}: \sum M_B{}^{+\circlearrowleft} = -60 \times 3 + 40 \times 3 - 30 \times 40)}$$
$$= -180\ \text{N.m}^{+\circlearrowleft}$$
$$= 180\ \text{N.m}^{\circlearrowleft}$$
$$\sum M_c{}^{+\circlearrowleft} = -60 \times 3 - 40 \times 4 + 40 \times 3$$
$$= -220\ \text{N.m}^{+\circlearrowleft}$$
$$= 220\ \text{N.m}^{\circlearrowleft}$$

Q5/ The resultant of two forces (p and Q) is 200N as shown in the below figure, (P) its direction along line AB and Q lies on the x-axis (horizontal axis), determine the magnitude of P and Q? **(20 Mark)**





Q3/ Compute the reactions of supports at (A and B) on the beam shown below. **(20 Mark)**



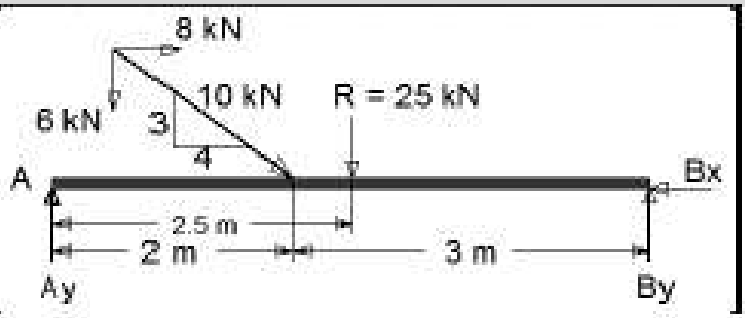
Solution:

$R = WL = 5 \times 5 = 25\ kN$

F.B.D. (AB):

$\sum F_x = 0 + \rightarrow$

$8 - B_X = 0 \Rightarrow B_X = 8\ kN \leftarrow$



$$\sum M_A{}^{+\circlearrowleft} = 0$$

$$-B_y(5) + 25(2.5) + 6(2) = 0 \Rightarrow B_y = 14.9\ kN \uparrow$$

$$\sum F_y = 0 + \uparrow$$

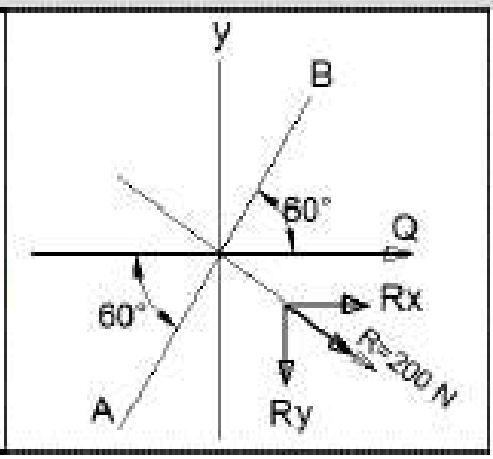
$$A_y + 14.9 - 25 - 6 = 0 \Rightarrow A_y = 16.1\ kN \uparrow$$

Solution:

$R_X = \sum F_x + \rightarrow$

$200 \times \frac{4}{5} = Q - P_x$

$160 = Q - P\cos 60$ 1



$R_y = \sum F_y + \uparrow$

$-200 \times \frac{3}{5} = -P_y$

$-120 = -P\sin 60$

$P = \frac{120}{\sin 60} \Rightarrow P = 138.56\ N \swarrow$

From Eq. 1

$160 = Q - 138.56\cos 60$

$Q = 90.72\ N \rightarrow$

Good Luck and Best Wishes

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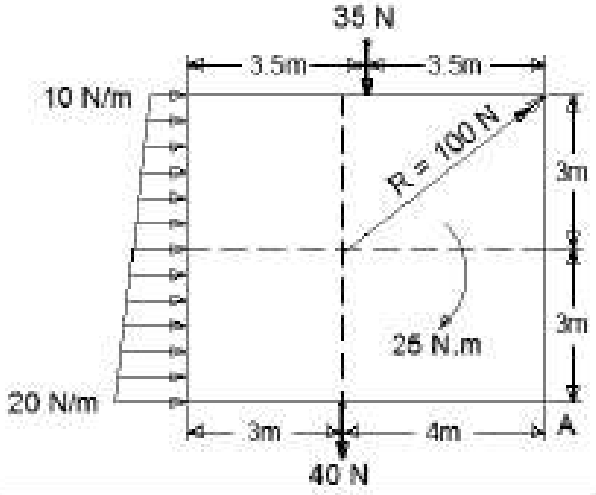

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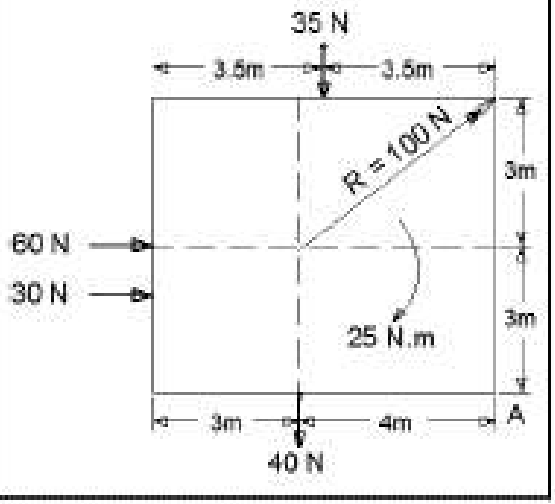

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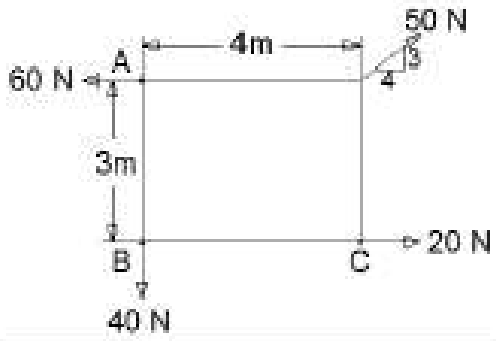

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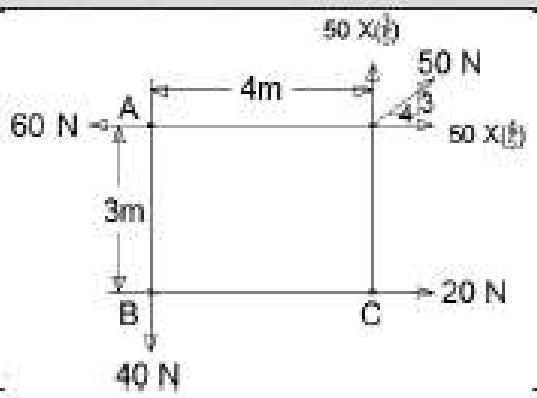

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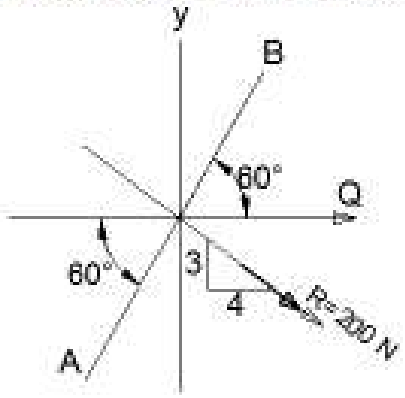

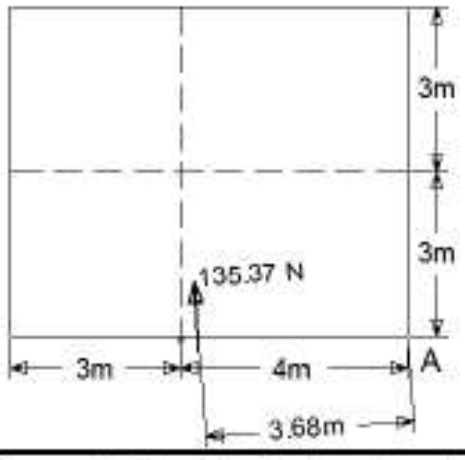

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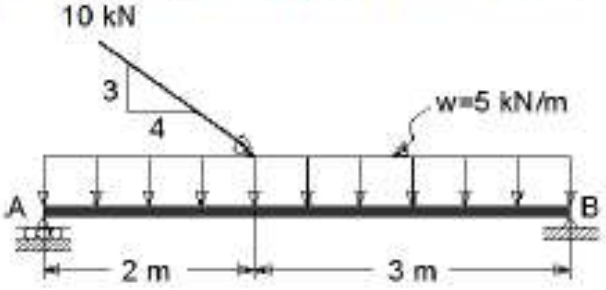

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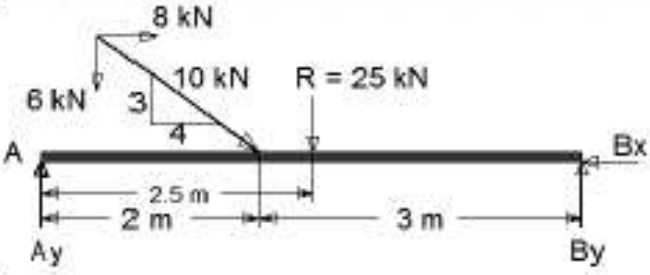

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- **Extra notes:**

This Course catalogue has been prepared by:

1- Assist. Prof. Dr. Khaleel Hasan Younis
2- Assist. Prof. Dr. Abdulafattah Ahmed Amin.

- **External Evaluator:**
  Assist. Prof. Dr. Ganjeena Jalal Medhat