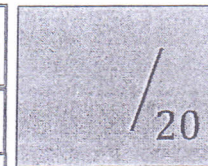




نورع 11

الإسم (رباعي):
Section:
Group:
يتكون الإمتحان من أربعة أسئلة في أربع صفحات. The Exam consists of 4 questions in 4 pages.



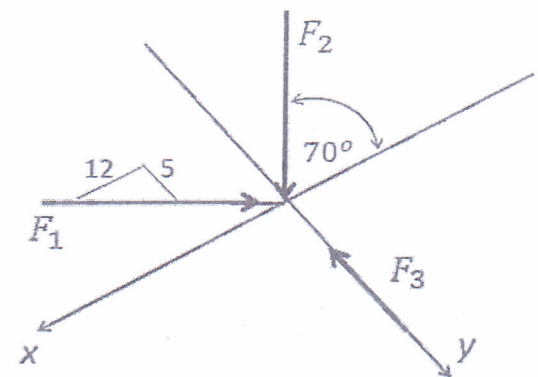
Question 1:
Question 2:
Question 3:
Question 4:

Total Marks: /40
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[Q. 1] [6 marks] If  $F_1 = 130 \text{ N}$ ,  $F_2 = 50 \text{ N}$  and  $F_3 = 80 \text{ N}$ , choose the correct answer of the following:

(i) The Cartesian vector form of  $F_1$  is [2 marks]

- a)  $50 \mathbf{i} + 120 \mathbf{j}$
- b)  $120 \mathbf{i} - 50 \mathbf{j}$
- c)  $-50 \mathbf{i} + 120 \mathbf{j}$
- d)  $-50 \mathbf{i} + 120 \mathbf{j}$



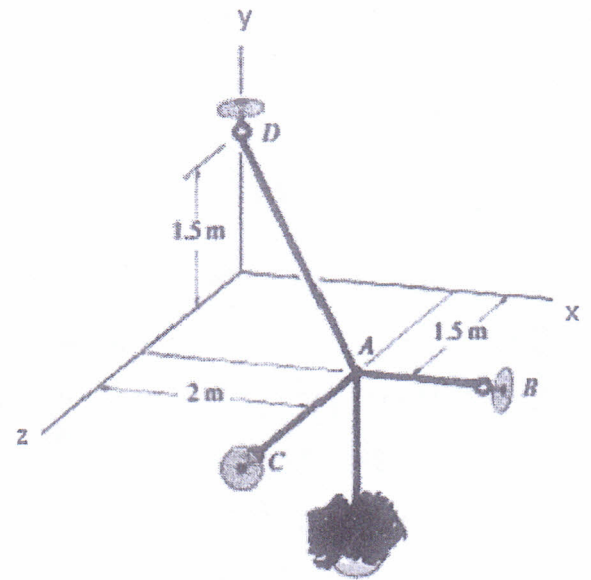
(ii) The Cartesian vector form of  $F_2$  is [2 marks]

- a)  $-47 \mathbf{i} + 17.1 \mathbf{j}$
- b)  $17.1 \mathbf{i} + 47 \mathbf{j}$
- c)  $-17.1 \mathbf{i} - 47 \mathbf{j}$
- d)  $47 \mathbf{i} - 17.1 \mathbf{j}$

(iii) The resultant force,  $R$ , of  $F_1$ ,  $F_2$  and  $F_3$  has a magnitude and angle with the positive x-axis as [2 marks]

- a)  $R = 93 \text{ N}$ , and  $\theta = 69.3^\circ$
- b)  $R = 93 \text{ N}$ , and  $\theta = 110.7^\circ$
- c)  $R = 93 \text{ N}$ , and  $\theta = -69.3^\circ$
- d)  $R = 93 \text{ N}$ , and  $\theta = 20.7^\circ$

[Q. 2] [10 marks] Determine the maximum mass of the supported crate so that the tension developed in any cable shown does not exceed 5 kN.



[Q. 3] [16 marks] Two forces  $F_1 = 400$  lb, and  $F_2 = 600$  lb are applied to the hook, as shown in the figure.

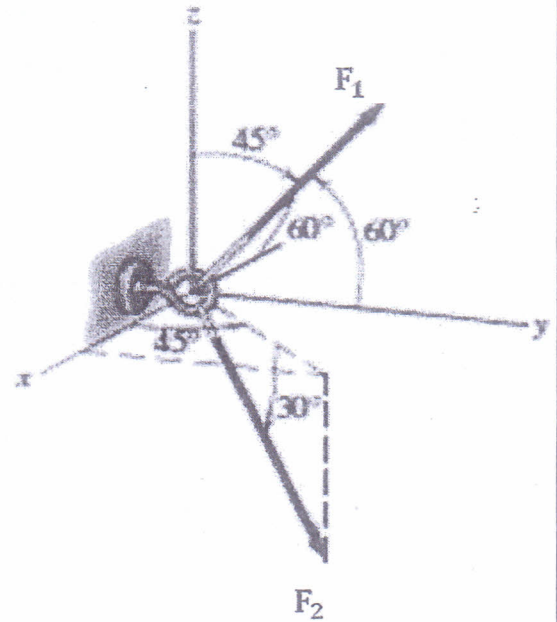
a) Express  $F_1$  and  $F_2$  as a Cartesian vectors.

[4 marks]

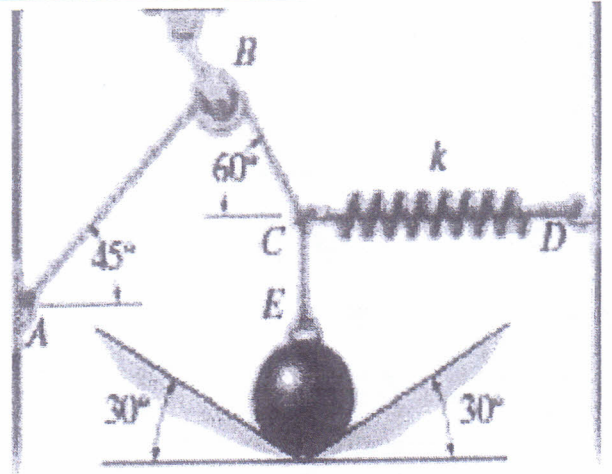
b) Determine the unit vectors perpendicular to both of  $F_1$  and  $F_2$ . [4 marks]

c) Determine the projections of  $F_1$  along the coordinate axes. [3 marks]

d) Determine the components of  $F_2$  which are parallel and perpendicular to  $F_1$ . Express the results in Cartesian vector forms. [5 marks]



[Q. 4] [8 marks] The 800 N sphere is supported by two smooth inclined planes, spring  $CD$ , and two cables  $ABC$  and  $CE$ . Determine the forces of the smooth planes on the sphere. If the tensile force of the cable  $ABC$  is 400 N.







الإسم (رباعي):

Section:

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The Exam consists of 4 questions in 4 pages.

20

Question 1:

Question 2:

Question 3:

Question 4:

Total Marks:

/40

[Q. 1] [6 marks] If  $F_1 = 52 \text{ N}$ ,  $F_2 = 20 \text{ N}$  and  $F_3 = 60 \text{ N}$ , choose the correct answer of the following:

(i) The Cartesian vector form of  $F_1$  is [2 marks]

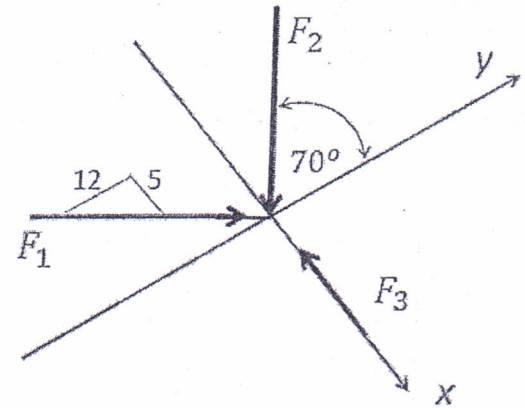
- a)  $20 \mathbf{i} + 48 \mathbf{j}$
- b)  $48 \mathbf{i} - 20 \mathbf{j}$
- c)  $-20 \mathbf{i} + 48 \mathbf{j}$
- d)  $48 \mathbf{i} + 20 \mathbf{j}$

(ii) The Cartesian vector form of  $F_2$  is [2 marks]

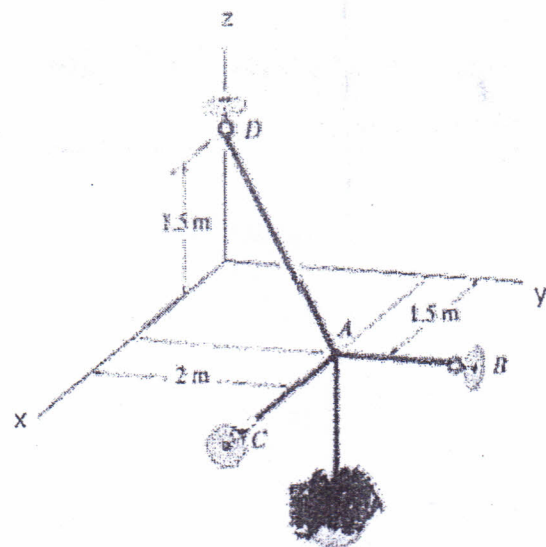
- a)  $-18.8 \mathbf{i} - 6.8 \mathbf{j}$
- b)  $18.8 \mathbf{i} - 6.8 \mathbf{j}$
- c)  $18.8 \mathbf{i} + 6.8 \mathbf{j}$
- d)  $-18.8 \mathbf{i} + 6.8 \mathbf{j}$

(iii) The resultant force,  $R$ , of  $F_1$ ,  $F_2$  and  $F_3$  has a magnitude and angle with the positive  $x$ -axis as [2 marks]

- a)  $R = 46.3 \text{ N}$ , and  $\theta = 117.2^\circ$
- b)  $R = 46.3 \text{ N}$ , and  $\theta = 62.8^\circ$
- c)  $R = 46.3 \text{ N}$ , and  $\theta = -62.8^\circ$
- d)  $R = 46.3 \text{ N}$ , and  $\theta = 242.8^\circ$



[Q. 2] [10 marks] Determine the maximum mass of the supported crate so that the tension developed in any cable shown does not exceed 5 kN.



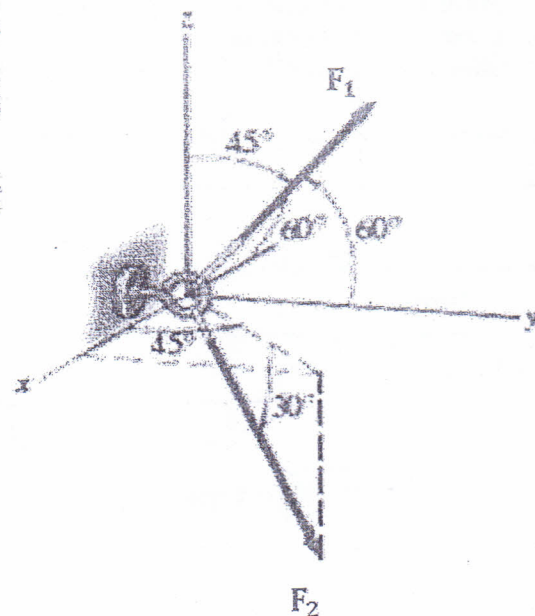
[Q. 3] [16 marks] Two forces  $F_1 = 600$  lb, and  $F_2 = 800$  lb are applied to the hook, as shown in the figure.

a) Express  $F_1$  and  $F_2$  as a Cartesian vectors. [4 marks]

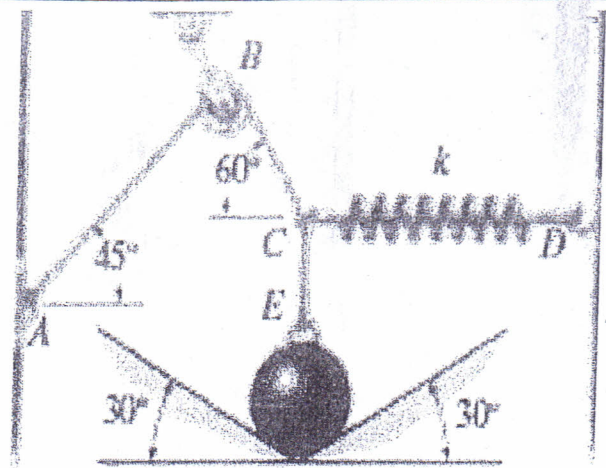
b) Determine the unit vectors perpendicular to both of  $F_1$  and  $F_2$ . [4 marks]

c) Determine the projections of  $F_1$  along the coordinate axes. [3 marks]

d) Determine the components of  $F_2$  which are parallel and perpendicular to  $F_1$ . Express the results in Cartesian vector forms. [5 marks]



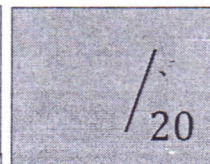
[Q. 4] [8 marks] The 800 N sphere is supported by two smooth inclined planes, spring  $CD$ , and two cables  $ABC$  and  $CE$ . Determine the forces of the smooth planes on the sphere. If the tensile force of the cable  $ABC$  is 400 N.







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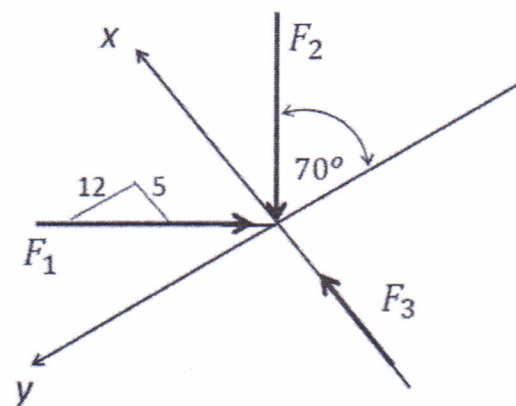
Question 1:
Question 2:
Question 3:
Question 4:

Total Marks: /40

[Q. 1] [6 marks] If  $F_1 = 65 \text{ N}$ ,  $F_2 = 25 \text{ N}$  and  $F_3 = 60 \text{ N}$ , choose the correct answer of the following:

(i) The Cartesian vector form of  $F_1$  is [2 marks]

- a)  $-25 \mathbf{i} - 60 \mathbf{j}$
- b)  $25 \mathbf{i} - 60 \mathbf{j}$
- c)  $60 \mathbf{i} - 25 \mathbf{j}$
- d)  $25 \mathbf{i} + 60 \mathbf{j}$



(ii) The Cartesian vector form of  $F_2$  is [2 marks]

- a)  $8.6 \mathbf{i} - 23.5 \mathbf{j}$
- b)  $8.6 \mathbf{i} + 23.5 \mathbf{j}$
- c)  $23.5 \mathbf{i} - 8.6 \mathbf{j}$
- d)  $-23.5 \mathbf{i} + 8.6 \mathbf{j}$

(iii) The resultant force,  $R$ , of  $F_1$ ,  $F_2$  and  $F_3$  has a magnitude and angle with the positive  $x$ -axis as [2 marks]

- a)  $R = 52.7 \text{ N}$ , and  $\theta = 257.4^\circ$
- b)  $R = 52.7 \text{ N}$ , and  $\theta = 77.4^\circ$
- c)  $R = 52.7 \text{ N}$ , and  $\theta = 282.6^\circ$
- d)  $R = 52.7 \text{ N}$ , and  $\theta = 102.6^\circ$

**[Q. 3] [16 marks]** Two forces  $F_1 = 200$  lb, and  $F_2 = 300$  lb are applied to the hook, as shown in the figure.

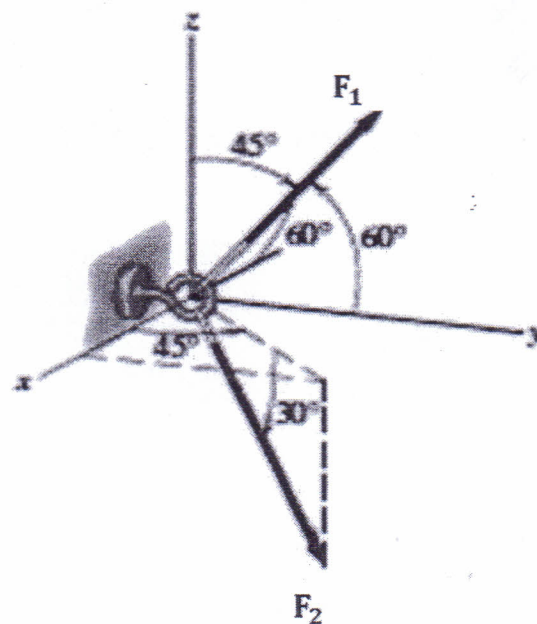
a) Express  $\mathbf{F}_1$  and  $\mathbf{F}_2$  as a Cartesian vectors.

**[4 marks]**

b) Determine the unit vectors perpendicular to both of  $\mathbf{F}_1$  and  $\mathbf{F}_2$ . **[4 marks]**

c) Determine the projections of  $\mathbf{F}_1$  along the coordinate axes. **[3 marks]**

d) Determine the components of  $\mathbf{F}_2$  which are parallel and perpendicular to  $\mathbf{F}_1$ . Express the results in Cartesian vector forms. **[5 marks]**



[Q. 4] [8 marks] The 800 N sphere is supported by two smooth inclined planes, spring  $CD$ , and two cables  $ABC$  and  $CE$ . Determine the forces of the smooth planes on the sphere. If the tensile force of the cable  $ABC$  is 400 N.

