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The Open University of Sri Lanka
Foundation Course in Science
Final Examination 2010/2011
MAF 1302/MAE 1302 - Applied Mathematics – Paper I

Duration :- 1 ½ Hours

Date :- 15-12-2010. **Time:- 01.30 p.m. –03.00 a.m.**

INSTRUCTIONS

Write down your Registration Number and Index Number on the dotted line below.

Reg. No. : ..... Index No. : .....

Question No.	Answer				Question No.	Answer			
01.	(a)	(b)	(c)	(d)	16.	(a)	(b)	(c)	(d)
02.	(a)	(b)	(c)	(d)	17.	(a)	(b)	(c)	(d)
03.	(a)	(b)	(c)	(d)	18.	(a)	(b)	(c)	(d)
04.	(a)	(b)	(c)	(d)	19.	(a)	(b)	(c)	(d)
05.	(a)	(b)	(c)	(d)	20.	(a)	(b)	(c)	(d)
06.	(a)	(b)	(c)	(d)	21.	(a)	(b)	(c)	(d)
07.	(a)	(b)	(c)	(d)	22.	(a)	(b)	(c)	(d)
08.	(a)	(b)	(c)	(d)	23.	(a)	(b)	(c)	(d)
09.	(a)	(b)	(c)	(d)	24.	(a)	(b)	(c)	(d)
10.	(a)	(b)	(c)	(d)	25.	(a)	(b)	(c)	(d)
11.	(a)	(b)	(c)	(d)	26.	(a)	(b)	(c)	(d)
12.	(a)	(b)	(c)	(d)	27.	(a)	(b)	(c)	(d)
13.	(a)	(b)	(c)	(d)	28.	(a)	(b)	(c)	(d)
14.	(a)	(b)	(c)	(d)	29.	(a)	(b)	(c)	(d)
15.	(a)	(b)	(c)	(d)	30.	(a)	(b)	(c)	(d)

ශ්‍රී ලංකා විවෘත විශ්වවිද්‍යාලය

විද්‍යාව පිළිබඳ පදනම් පාඨමාලාව
අවසාන පරීක්ෂණය -2010/2011

MAF 1302/MAE 1302- ව්‍යවහාරික ගණිතය – ප්‍රශ්න පත්‍රය I

කාලය පැය 1 1/2 යි.

දිනය : 2010.12.15 වේලාව -ප.ව. 01.30 – ප.ව.03.00

ප්‍රශ්න සියල්ලටම පිළිතුරු සපයන්න.

එක් එක් ප්‍රශ්නය සඳහා (a),(b).(c) හා (d) යනුවෙන් නම් කරන ලද පිළිතුරු හතරක් දී තිබේ. නිවැරදි යයි ඔබ තෝරා ගනු ලබන පිළිතුරට අදාළ අක්ෂරය, ප්‍රශ්න පත්‍රයට අතිරේකව සපයා ඇති පිළිතුරු පත්‍රයෙන් තෝරා, එය මත කතිරයක් (X) ගසන්න.

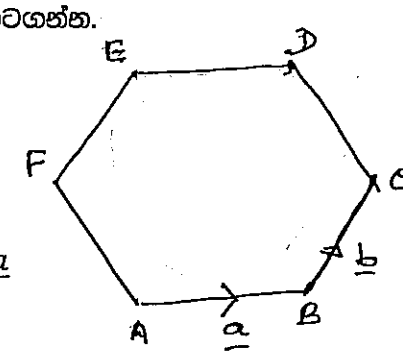
එක් එක් ප්‍රශ්නය සඳහා ලකුණු කළ යුත්තේ එක් පිළිතුරක් පමණි.

පිළිතුරු සපයා අවසන් වූ පසු එම පිළිතුරු පත්‍රිකාව මෙම ප්‍රශ්න පත්‍රයේ මුලට අමුණා ඉදිරිපත් කළ යුතුය.

පිළිතුරු ඇගයීමේදී සලකා බලනු ලබන්නේ පිළිතුරු පත්‍රිකාවේ සඳහන් කරනු ලබන පිළිතුරු පමණක් බව සලකන්න.

$g = 9.8 ms^{-2}$ ලෙස ගන්න.

ප්‍රශ්න අංක 01,02,03,04 හා 05 සඳහා පහත සඳහන් රූපය උපයෝගී කොටගන්න.



ABCDEF සවිධි ෂඩාස්‍රයේ $\overrightarrow{AB} = \underline{a}$ and $\overrightarrow{BC} = \underline{b}$. වේ.

1. $\overrightarrow{DE}$ දෛශිකය වනුයේ
(a) $\underline{b}$ (b) $-\underline{b}$ (c) $\underline{a}$ (d) $-\underline{a}$

2. $\overrightarrow{FE}$ දෛශිකය වනුයේ

(a) $-\underline{b}$ (b) $\underline{b}$ (c) $-\underline{a}$ (d) a

3. $\overrightarrow{AC}$ දෛශිකය වනුයේ
(a) $\underline{a} + \underline{b}$ (b) $\underline{a} - \underline{b}$ (c) $\underline{b} - \underline{a}$ (d) $2\underline{a} - \underline{b}$

4. $\overrightarrow{AD}$ දෛශිකය වනුයේ

(a) $2\underline{a}$ (b) $2\underline{b}$ (c) $2(\underline{a} + \underline{b})$ (d) $2(\underline{a} - \underline{b})$

5. $\overrightarrow{DC}$ දෛශිකය වනුයේ

(a) $\underline{b} + \underline{a}$ (b) $\underline{a} - \underline{b}$ (c) $\underline{b} - \underline{a}$ (d) $2\underline{b} - \underline{a}$

6. $\underline{a} = 2\underline{i} - \underline{j} + \underline{k}$ සහ $\underline{b} = \underline{i} - \underline{j} + 2\underline{k}$ නම් $\underline{a}.\underline{b} =$
(a) 5 (b) -5 (c) 0 (d) 3

7. $\underline{p} = \underline{i} - \underline{j} + 2\underline{k}$ සහ $\underline{q} = 2\underline{i} + \underline{j} - 2\underline{k}$ නම් $\underline{p} \times (\underline{p} + \underline{q}) =$

(a) $2\underline{i} - \underline{j} + \underline{k}$ (b) $2\underline{i} - \underline{j} + 3\underline{k}$ (c) $\underline{i} - 3\underline{j} - \underline{k}$ (d) $\underline{i} + 7\underline{j} + 3\underline{k}$

8. P හා Q යනු බල දෙකේ එකතුව 15 ක්ද ගුණිතය 56 ක් ද සම්ප්‍රයුක්තය 13 ක් ද වේ. P හා Q බල දෙක අතර කෝණය වනුයේ,

(a) 30^0 (b) 60^0 (c) 90^0 (d) 120^0

9. එකිනෙකට ලම්බක බල දෙකක සම්ප්‍රයුක්ත බලය 13 ඒ වන අතර එක් බලයක් 5ඒ වේ. අනෙක් බලය වනුයේ,

(a) 13N (b) 5N (c) 12N (d) 15N

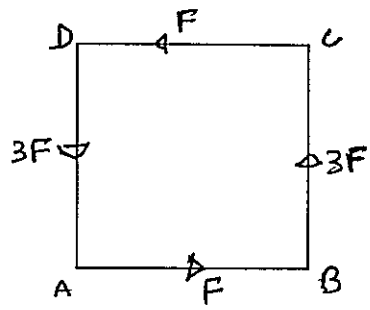
10. තිරසට 30^0 කෝණයකින් ආනත රළු තලයක් මත ස්කන්ධය m වූ අංශුවක් සීමාකාරී සමතුලිතතාවයේ පවති. අංශුව හා තලය අතර ඝර්ෂණ සංගුණකය වනුයේ,

(a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$ (c) 1 (d) $\frac{1}{2}$

11. එකිනෙකට 5m ඈතින් තිරස් බාල්කයක ලක්ෂ්‍ය දෙකකට සම්බන්ධ කොට ඇත. 3m හා 4m අවිතන්‍ය තන්තු කෙක් මඟින් 100N භාරයක් එල්ලා සමතුලිතතාවයේ තිබේ. තන්තුවල ආතති වනුයේ,

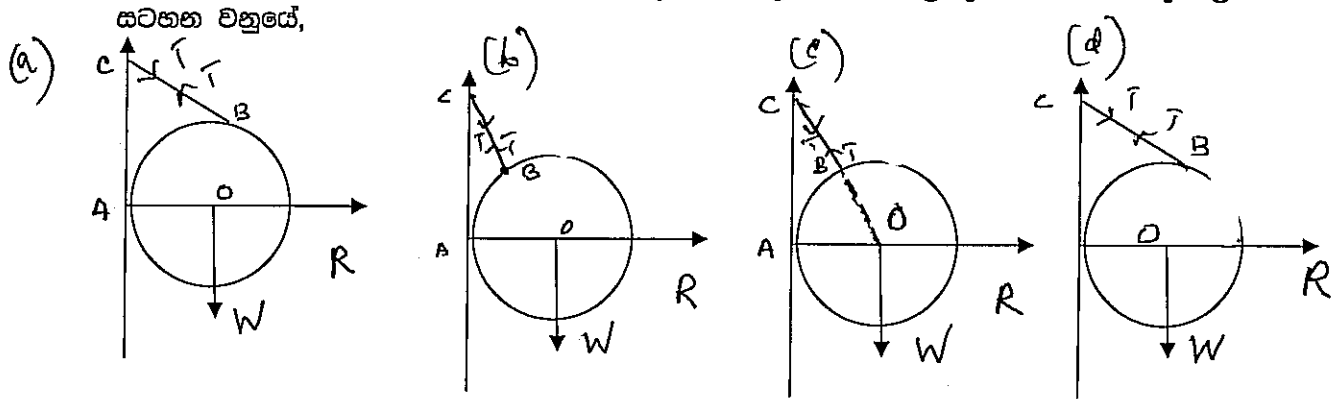
(a) 80N, 60N (b) 100N,60N (c) 100N,160N (d) 120N,160N

12. ඒකතල බල පද්ධතියක් පහත රූපයේ පරිදි සමචතුරස්‍රයක පාද දිගේ ක්‍රියා කරයි. මෙම බල පද්ධතිය



(a) තනි බලයකට තුල්‍ය වේ.
(b) බල යුග්මයකට තුල්‍ය වේ.
(c) සමතුලිතතාවයේ පවති.
(d) තනි බලයකට හා යුග්මයකට තුල්‍ය වේ.

13. අරය r හා බර W වූ ඒකාකාර ගෝලයක් සුමට සිරස් බිත්තියක් ස්පර්ශ කරමින් සමතුලිතාවයේ පවතින්නේ ගෝලයේ මතුපිට ලක්ෂ්‍යයකට හා බිත්තියේ පිහිටි ලක්ෂ්‍යයකට සම්බන්ධ කරන දිග r වූ අවිතන්‍ය තන්තුවක් මඟිනි. මෙම ගෝලය මත ක්‍රියාකරන බල දැක්වෙන නිවැරදි බල රූප සටහන වනුයේ,



14. ප්‍රශ්න අංක 13 තන්තුව පහලට ඇදී සිරස සමඟ සාදන කෝණය වනුයේ,

(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

15. ප්‍රශ්න අංක 13 හේ බිත්තිය හා ගෝලය අතර ප්‍රතික්‍රියාව වනුයේ

(a) $\frac{2w}{\sqrt{3}}$ (b) $\frac{\sqrt{3}W}{2}$ (c) $\frac{W}{2\sqrt{3}}$ (d) $\frac{W}{\sqrt{3}}$

16. ප්‍රශ්න අංක 13 හේ තන්තුවේ ආතතිය වනුයේ

(a) $\frac{2w}{\sqrt{3}}$ (b) $\frac{\sqrt{3}W}{2}$ (c) $\frac{W}{2\sqrt{3}}$ (d) $\frac{W}{\sqrt{3}}$

17. ABCDEF සවිධි ෂඩාස්‍රයේ පිළිවෙලින් $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{DB}, \overrightarrow{EF}$, හා $\overrightarrow{FA}$ පාද දිගේ P, 2P, 3P, 4P, 5P හා 6P යන බල ක්‍රියා කරයි. O යනු ෂඩාස්‍රයේ කේන්ද්‍රය වේ.

O වටා බල පද්ධතියේ වාමාවර්ත ඝූර්ණය වනුයේ

(a) $21\sqrt{3}P$ (b) $\frac{21\sqrt{3}P}{2}$ (c) $\frac{20\sqrt{3}P}{2}$ (d) $\frac{21\sqrt{3}P}{4}$

18. ප්‍රශ්න අංක 17 බල පද්ධතියේ සම්ප්‍රයුක්තය වනුයේ
(a) 3P (b) 4P (c) 5P (d) 6P

19. ප්‍රශ්න අංක 17 එම බල පද්ධතියේ සම්ප්‍රයුක්තය AB සමඟ සාදන කෝණය වනුයේ,
(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

20. තිරසට $tan^{-1}(\frac{3}{4})$ කෝණයකින් ආනතව $20ms^{-1}$ ප්‍රවේගයකින් තිරස් බිමේ පිහිටි O ලක්ෂ්‍යයක සිට බෝලයක් ප්‍රක්ෂේපනය කරනු ලැබේ. ප්‍රක්ෂේපනයෙන් තත්පර 2 කට පසුව ප්‍රක්ෂේපණ ප්‍රවේගයේ තිරස් සංරචක වනුයේ,
(a) $4ms^{-1}$ (b) $16ms^{-1}$ (c) $12ms^{-1}$ (d) $4ms^{-1}$

21. ප්‍රශ්න අංක 20 තත්පර 2 කට පසු අංශුවේ ප්‍රවේගයේ පහලට සිරස් සංරචකය වනුයේ,
(a) $4ms^{-1}$ (b) $12ms^{-1}$ (c) $8ms^{-1}$ (d) $10ms^{-1}$

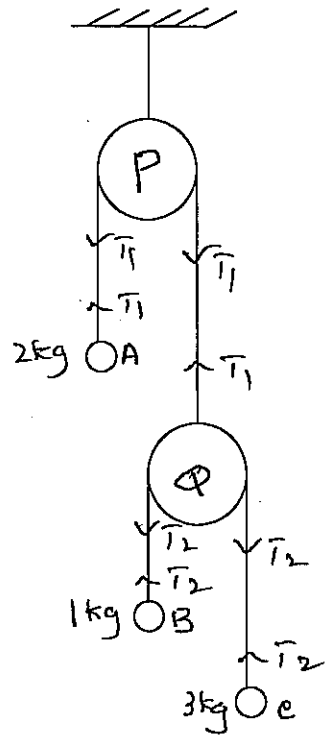
22. ප්‍රශ්න අංක 20 අංශුවේ තිරස් පරාසය වනුයේ
(a) 35.2m (b) 37.4m (c) 38.4m (d) 39m

23. ප්‍රශ්න අංක 20 අංශුව ඉහත නගින උපරිම උස වනුයේ
(a) 8.2m (b) 7.2m (c) 6.2m (d) 10m

24. ප්‍රශ්න අංක 20 අංශුවේ පියාසර කාලය වනුයේ,
(a) $\frac{12}{5}s$ (b) $\frac{8}{5}s$ (c) $\frac{11}{5}s$ (d) $\frac{7}{5}s$

ප්‍රශ්න අංක 25, 26,27,28 හා 29 සඳහා පහත සඳහන් රූප සටහන උපයෝගී කොට ගන්න.

ස්කන්ධය 2 kg වූ A නම් අංශුවක් අවිතන්‍ය තන්තුවක එක් කෙලවරකට සම්බන්ධ කොට නම් අවල කප්පිය වටා ගොස් P නම් සැහැල්ලු සවල කප්පියකට සම්බන්ධකොට තිබේ. ස්කන්ධය 1kg වූ B නම් තවත් අංශුවක් තවත් අවිතන්‍ය තන්තුවක එක් කෙලවරකට සම්බන්ධ කොට Q නම් සැහැල්ලු සවල කප්පිය වටා ගොස් ස්කන්ධය 3kg වූ නම් තවත් අංශුවකට සම්බන්ධ කොට පද්ධතිය නිදහසේ චලනය වීමට ඉඩ හරිනු ලැබේ.



25. A අංශුවේ ත්වරණය වනුයේ

$(a)\frac{g}{5}$ $(b)\frac{3g}{5}$ $(c)\ \frac{2g}{5}$ $(d)\quad g/5$

26. B අංශුවේ ත්වරණය වනුයේ

$(a)\frac{g}{5}$ $(b)\frac{3g}{5}$ $(c)\ \frac{7g}{5}$ $(d)\ \frac{6g}{5}$

27. C අංශුවේ ත්වරණය වනුයේ

$(a)\frac{g}{5}$ $(b)\frac{3g}{5}$ $(c)\ \frac{49}{5}$ $(d)\quad \frac{7g}{5}$

28. තන්තුවේ ආතතිය $T_1{}^{=}$

$(a)\frac{2g}{5}$ $(b)\frac{4g}{5}$ $(c)\ \frac{12g}{5}$ $(d)\quad \frac{8g}{5}$

29. තන්තුවේ ආතතිය $T_2{}^{=6}$

$(a)\frac{6g}{5}$ $(b)\frac{79}{5}$ $(c)\ \frac{8g}{5}$ $(d)\quad \frac{11g}{5}$

30. $12ms^{-1}$ ප්‍රවේගයෙන් චලනය වන බෝලයක් එයට ලම්බක දිශාවට පිහිටි අවල සිරස් තලයක තිරස්ව ගැටේ. ගැටුම සඳහා ප්‍රත්‍යාගති සංගුණකය 1/3 නම් අංශුව පොලා පනින ප්‍රවේගය

(a) $5ms^{-1}$ (b) $4ms^{-1}$ (c) $10ms^{-1}$ (d) $8ms^{-1}$

- නිමිකම් ඇවිරිණි. -

THE OPEN UNIVERSITY OF SRI LANKA

FOUNDATION COURSE IN SCIENCE

FINAL EXAMINATION – 2010/2011

MAF1302/MAE1302 – APPLIED MATHEMATICS – PAPER I

DURATION – ONE AND HALF(1-1/2) HOURS

DATE : 15th December 2010 **TIME: 1.30 p.m. – 3.00 p.m.**

Answer FIVE questions only.

Take $g = 9.8ms^{-2}$ unless otherwise stated.

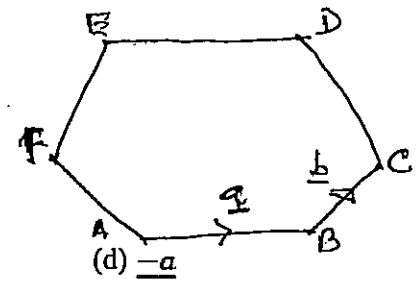
Answer All questions.

For each question there are **four** suggested answers labeled (a), (b), (c), and (d). When you have selected your answer to a question, draw a cross (x) on the letter of the answer you have chosen in the **Separate Answer Sheet** provided.

Mark only one answer for each question on the separate answer sheet.
Where necessary do all computations on the question paper.
When you have finished answering, please attaché your answer sheet at the top of this question paper. Only the answers marked on the **Answer Sheet** will be considered for evaluation.

Use the diagram for Question numbers ,1 2, 3, 4 and 5.

ABCDEF is a regular hexagon $\overrightarrow{AB} = \underline{a}$ and $\overrightarrow{BC} = \underline{b}$.



1. Vector $\overrightarrow{DE}$ is equal to
   (a) $\underline{b}$ (b) $-\underline{b}$ (c) $\underline{a}$ (d) $-\underline{a}$

2. Vector $\overrightarrow{FE}$ is equal to
   (a) $-\underline{b}$ (b) $\underline{b}$ (c) $-\underline{a}$ (d) a

3. Vector $\overrightarrow{AC}$ is equal to
   (a) $\underline{a} + \underline{b}$ (b) $\underline{a} - \underline{b}$ (c) $\underline{b} - \underline{a}$ (d) $2\underline{a} - \underline{b}$

4. Vector $\overrightarrow{AD}$ is equal to
   (a) $2\underline{a}$ (b) $2\underline{b}$ (c) $2(\underline{a} + \underline{b})$ (d) $2(\underline{a} - \underline{b})$

5. Vector $\overrightarrow{DC}$ is equal to
   (a) $\underline{b} + \underline{a}$ (b) $\underline{a} - \underline{b}$ (c) $\underline{b} - \underline{a}$ (d) $2\underline{b} - \underline{a}$

6. $\underline{a} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{b} = \underline{i} - \underline{j} + 2\underline{k}$ $\underline{a}.\underline{b}$ is equal to
   (a) 5 (b) -5 (c) 0 (d) 3

7. If $\underline{p} = \underline{i} - \underline{j} + 2\underline{k}$ and $\underline{q} = 2\underline{i} + \underline{j} - 2\underline{k}$ then $\underline{p} \times (\underline{p} + \underline{q})$ is equal to
   (a) $2\underline{i} - \underline{j} + \underline{k}$ (b) $2\underline{i} - \underline{j} + 3\underline{k}$ (c) $\underline{i} - 3\underline{j} - \underline{k}$ (d) $\underline{i} + 7\underline{j} + 3\underline{k}$

8. If P and Q are any two forces such that P + Q = 15 , PQ = 56 and the resultant of P and Q is equal to 13. The angle between these two forces are equal to
   (a) 30^0 (b) 60^0 (c) 90^0 (d) 120^0

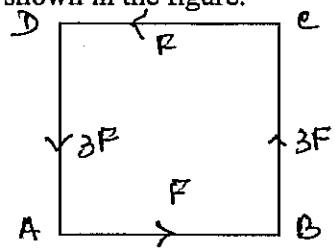
9. Resultant of the two perpendicular forces is 13N. if are one force is 5N, other force is equal to
   (a) 13N (b) 5N (c) 12N (d) 15N

10. A particle of mass m is in limiting equilibrium on an inclined rough plane which make s an angle 30^0 with the horizontal Coefficient of Friction plane and the particle is equal to
    (a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$ (c) 1 (d) $\frac{1}{2}$

11. A small block of weight 100N is suspended by two strings of length 3m and 4m from two points 5m apart on a horizontal beam. The tension in the strings are.

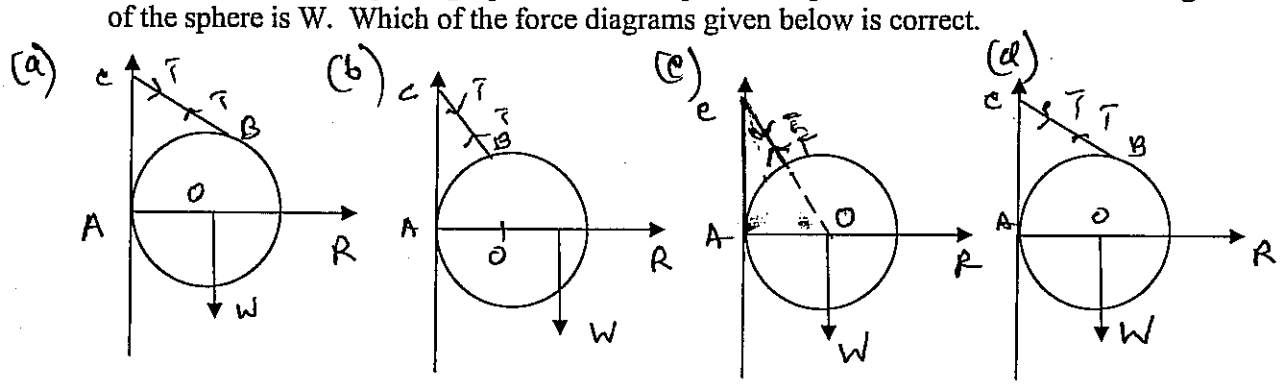
(a) 80N, 60N (b) 100N,60N (c) 100N,160N (d) 120N,160N

12. A system consists of forces acting on the sides of a square as shown in the figure.



(a) The system is equivalent to single force
(b) The system is equivalent to a couple
(c) The system is equivalent to a equilibrium
(d) The system is equivalent to a single force and a couple

13. A point on a sphere of radius r, rests in contact with a smooth vertical wall and is supported by a string of length r joining a point B on the sphere to a point C on the wall. If the weight of the sphere is W. Which of the force diagrams given below is correct.



14. In Question no 13 the angle between the string and the downward vertical is equal to

(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

15. In Question No. 13 the reaction between the wall and the sphere is equal to

(a) $\frac{2w}{\sqrt{3}}$ (b) $\frac{\sqrt{3}W}{2}$ (c) $\frac{W}{2\sqrt{3}}$ (d) $\frac{W}{\sqrt{3}}$

16. In Question No.13, the tension in the string is equal to

(a) $\frac{2w}{\sqrt{3}}$ (b) $\frac{\sqrt{3}W}{2}$ (c) $\frac{W}{2\sqrt{3}}$ (d) $\frac{W}{\sqrt{3}}$

17. Forces P, 2P, 3P, 4P, 5P and 6P act along the sides $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{DE}, \overrightarrow{EF}$ *and* $\overrightarrow{FA}$ Of a regular hexagon where each side is 1cm. The O is the centre of the regular hexagon. Anticlockwise moment about the centre O is equal to

(a) $21\sqrt{3}P$ (b) $\frac{21\sqrt{3}P}{2}$ (c) $\frac{20\sqrt{3}P}{2}$ (d) $\frac{21\sqrt{3}P}{4}$

18. In Question No. 17, Resultant force of the system is equal to

a) 3P (b) 4P (c) 5P (d) 6P

19. In Question No. 17, Resultant makes angle with AB is equal to
(a) 30^0 (b) 45^0 (c) 60^0 (d) 90^0

20. A Ball thrown with a speed of $20ms^{-1}$ at an angle $tan^{-1}(\frac{3}{4})$ to the horizontal point O in the ground. Its horizontal component of velocity two seconds later is

(a) $4ms^{-1}$ (b) $16ms^{-1}$ (c) $12ms^{-1}$ (d) $6ms^{-1}$

21. In Question No. 20 downward vertical component of velocity two second later is

(a) $4ms^{-1}$ (b) $12ms^{-1}$ (c) $8ms^{-1}$ (d) $10ms^{-1}$

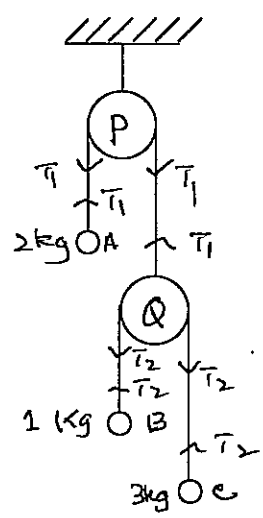
22. In Question No. 20 horizontal range is equal to
(a) 35.2m (b) 37.4m (c) 38.4m (d) 39m

23. In Question No. 20 maximum height attained by the ball is
(a) 8.2m (b) 7.2m (c) 6.2m (d) 10m

24. In Question No. 20 flying time of ball is
(a) $\frac{12}{5}S$ (b) $\frac{8}{5}S$ (c) $\frac{11}{5}S$ (d) $\frac{7}{5}S$

Use this diagram below for questions 25,26,27,28 and 29.

A particle A of mass 2 kg connected to a light inextensible string. Another particle B of mass 1 kg is connected to particle C of mass 3 kg by another light inextensible string which passes over the moveable light pulley Q.



25. Acceleration of the particle A is equal to

(a) $\frac{g}{5}$ (b) $\frac{3g}{5}$ (c) $\frac{2g}{5}$ (d) $g/5$

26. Acceleration of the particle B is equal to

(a) $\frac{g}{5}$ (b) $\frac{3g}{5}$ (c) $\frac{2g}{5}$ (d) $\frac{6g}{5}$

27. Acceleration of the particle C is equal to

(a) $\frac{g}{5}$ (b) $\frac{3g}{5}$ (c) $\frac{4g}{5}$ (d) $\frac{7g}{5}$

28. Tension T_1 in the string that passes over the pulley P is

(a) $\frac{2g}{5}$ (b) $\frac{4g}{5}$ (c) $\frac{12g}{5}$ (d) $\frac{8g}{5}$

29. Tension T_2 in the string that passes over the pulley Q is

(a) $\frac{6g}{5}$ (b) $\frac{7g}{5}$ (c) $\frac{8g}{5}$ (d) $\frac{11g}{5}$

30. A ball moving with a velocity of $12ms^{-1}$ impinges on a smooth fired plane which is perpendicular to the motion of ball. It the coefficient of restitution $\frac{1}{3}$; the rebound velocity of the ball of the impacts

(a) $5ms^{-1}$ (b) $4ms^{-1}$ (c) $10ms^{-1}$ (d) $8ms^{-1}$

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ශ්‍රී ලංකා විවෘත විශ්වවිද්‍යාලය

විද්‍යාව පිළිබඳ පදනම් පාඨමාලාව
අවසාන පරීක්ෂණය -2010/2011

MAF 1302/MAE 1302- ව්‍යවහාරික ගණිතය – ප්‍රශ්න පත්‍රය II

කාලය පැය තුනයි.

දිනය : 2010.12.15 වේලාව -පෙ.ව. 09.30 – ප.ව.12.30

ප්‍රශ්න පහකට පිළිතුරු සපයන්න.
$g = 9.8\ ms^{-2}$ ලෙස ගන්න.

01. දුම්රියක් සාමාන්‍යයෙන් $u\ kmh^{-1}$ ප්‍රවේගයෙන් ගමන් කරන ලෙස දක්වා ඇත. දුම්රිය මාර්ගය අලුත්වැඩියා කිරීම නිසා මෙම ගමනේ $2d$ km දුරක් දුම්රිය ගමන් කරන ලද්දේ $\frac{U}{2} kmh^{-1}$ ඒකාකාර ප්‍රවේගයෙනි. ඒකාකාර ප්‍රවේගයෙන් ගමන් කිරීමට පූර්ව dkm දුරක් මන්දනයෙන් ද, ඒකාකාර ප්‍රවේගයෙන් ගමන් කිරීමෙන් පසු $3d$ km දුරක් ඒකාකාර ත්වරණයකින් ගමන් කොට $u\ kmh^{-1}$ ප්‍රවේගයට ලඟා වේ.

දුම්රියේ චලිතය සඳහා ප්‍රවේග කාල ප්‍රස්ථාරය අඳින්න.

දුම්රිය මාර්ගය අලුත්වැඩියා කිරීම නිසා සාමාන්‍ය දිනකට වඩා පැය $\frac{10d}{3u}$ කාලයක් ප්‍රමාද වන බව පෙන්වන්න.

02. ස්කන්ධය $6m$ වූ සුමට කුඤ්ඤයක ABC හරස්කඩ $A\hat{B}C = 90^0$ හා AB = AC වේ. BC මුණත සුමට මේසයක් ස්පර්ශ කරමින් සිටී. ස්කන්ධය $3m$ හා m වූ අංශු දෙකක් අවිතන්‍ය තන්තුවකින් සම්බන්ධකොට කුඤ්ඤයේ තල මුණත් දෙකක් මත තබා පද්ධතිය සිරුවෙන් මුදා හරිනු ලැබේ. කුඤ්ඤයේ ත්වරණයත් තන්තුවේ ආතතියත් සොයන්න.

03. ස්කන්ධය 1000 kg වූ මෝටර් රථයක් R නිවිටන් නියත ප්‍රතිරෝධයක යටතේ උපරිම ජවයෙන් වැඩ කරනු ලැබේ. තිරස් මාර්ගයේ දී මෝටර් රථයේ උපරිම ප්‍රවේගය $120\ kmh^{-1}$ වන අතර තිරසට θ කෝණයකින් ආනත මාර්ගයකදී උපරිම ප්‍රවේගය $60\ kmh^{-1}$වේ. මෙහි $sin\theta = \frac{1}{100}$ වේ.

(a) තිරස් මාර්ගයේදී (b) ආනත මාර්ගයේ දී

මෝටර් රථය, $1000kg$ වූ තවත් රථයක් ඇදගෙන යනවිට මෝටර් රථයේ හා ඇදගෙන යන රථයේ මුළු ප්‍රතිරෝධය $3R$ වන විට ඉහත අවස්ථා දෙකේ දී මෝටර් රථයේ උපරිම ප්‍රවේගය සොයන්න.

04. A හා B යන සමාන ගෝල දෙකක් සුමට තිරස් තලයක වලනය විය හැක. A ගෝලය u ප්‍රවේගයෙන් නිශ්චලව ඇති A ගෝලය හා සරල ලෙස ගැටෙනසේ ප්‍රක්ෂේපනය කරනු ලැබේ. ඉන් පසුව B ගෝලය මෙම තලයට ලම්බක බිත්තියක සරල ලෙස ගැටේ. ඉන් පසු B ගෝලය නැවත A හා ගැටේ. ගැටුමෙන් පසු A ඝෂණිකව නිශ්චලතාවයට පත් වේ.
සියලුම ගැටුම් සඳහා ප්‍රත්‍යාගති සංගුණකය වන e එකම වන අතර $e = 1$ බව පෙන්වන්න.

05. P හා Q තිරස් තලයේ ඇති ලක්ෂ්‍ය දෙකකින් අංශු දෙකක් එකවිට ප්‍රක්ෂේපනය කලවිට ඒවා එකිනෙකට තිරස්ව ගමන් කරන අවස්ථාවේ මුහුණට මුහුණ ලා ගැටේ. පළමු අංශුව v ms^{-1} ප්‍රවේගයෙන් ද ප්‍රක්ෂේපන කෝණය α වන සේ ද දෙවන අංශුව $v/2$ ms^{-1} ප්‍රවේගයෙන් ද ප්‍රක්ෂේපන කෝණය β ද වනසේ ප්‍රක්ෂේපනය කලේ නම් ද $PQ = \frac{v^2 \sin\beta}{2g}$ ද නම් (a) $\sin\alpha = \sin\beta$ හා $(b) 2 = 2\cos\alpha + \cos\beta$ බව පෙන්වන්න. තවද $\cos\alpha = 7/8$ බව ද පෙන්වන්න.

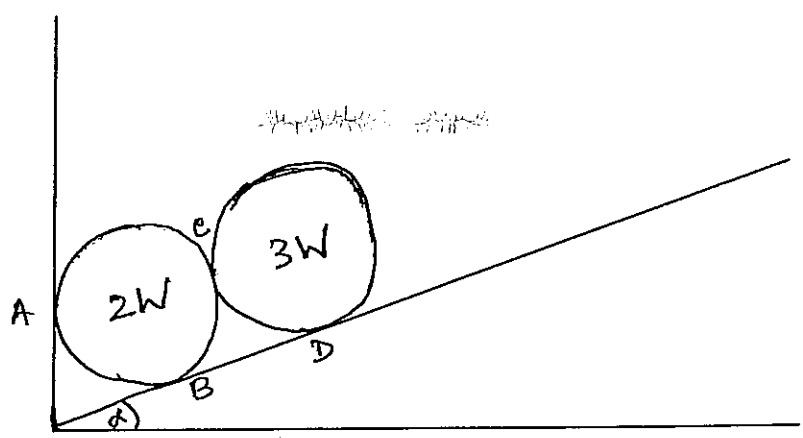
06. දිග 2a වූ ද බර W වූ ද AB ඒකාකාර දණ්ඩක A කෙලවර අසව් කර ඇති අතර B කෙලවරින් 2W භාරයක් එල්ලා දණ්ඩ තිරස්ව සමතුලිතතාවයේ තබා ඇත්තේ දණ්ඩේ මධ්‍ය ලක්ෂ්‍යය වන C ට හා A ට ඉහළින් පිහිටි ලක්ෂ්‍යයකට සම්බන්ධ කොට දිග 2a වූ සැහැල්ලු අවිතන්‍ය තන්තුවක් මගිනි. තන්තුවේ ආතතිය ද A අසවිවේ ප්‍රතික්‍රියාව ද W ඇසුරින් සොයන්න.

07. ABCD සමචතුරස්‍රයේ පාදයක දිග a වේ. විශාලත්වය 4,3,2,1,P හා Q බල පිලිවෙලින් හා $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{AD}, \overrightarrow{AC}$ හා $\overrightarrow{BD}$ පාද දිගේ පිළිවෙලින් ක්‍රියා කරයි.

(i) මෙම බල පද්ධතියේ සම්ප්‍රයුක්තය AB දිගේ ක්‍රියා කරන විට P හා Q සොයන්න.

(ii) මෙම සම්ප්‍රයුක්ත බලය AC ට සමාන්තරව B හරහා ගමන් කරන විට එම සම්ප්‍රයුක්ත බලයේ විශාලත්වය සොයන්න.

08. පහත රූපයේ පරිදි තිරසට α කෝණයකින් ආනත සුමට තලයක් මත ඒකාකාර බර සිලින්ඩර දෙකක් තබා ඇත. පහල සිලින්ඩරය සිරස් බිත්තියක් ස්පර්ශ කරමින් ද පවතී. පහල සිලින්ඩරයේ බර 2W වන අතර ඉහල සිලින්ඩරයේ බර 3W වේ. සියළුම ස්පර්ශ සුමට නම් A,B,C හා D ලක්ෂ්‍යවල ප්‍රතික්‍රියා සොයන්න.



THE OPEN UNIVERSITY OF SRI LANKA

FOUNDATION COURSE IN SCIENCE

FINAL EXAMINATION – 2010/2011

MAF1302/MAE1302 – APPLIED MATHEMATICS – PAPER II

DURATION – THREE (03) HOURS

DATE : 15th December 2010 **TIME: 9.30 a.m. – 12.30 p.m.**

Answer FIVE questions only.

Take g = 9.8ms^{-2} unless otherwise stated.

01. A train normally runs in a straight track at a uniform velocity $U kmh^{-1}$. Due to a repair ahead in the track, it slows down to a velocity at a uniform retardation over a distance d *km*. Next the train moves with uniform velocity $\frac{u}{2} kmh^{-1}$ over $2d$ *km* of the track under repair. Then moving with uniform acceleration over a distance $3d$ *km* it reaches the velocity U.

Sketch the velocity-time graph for the motion of the train.

Show that the time lost due to the track repair as compared with normal running of the train is $\frac{10d}{3u} hr$.

02. A smooth wedge of mass 6m has a normal cross section ABC such that AB=AC and the angle BAC is a right angle. The face containing BC is in contact with a horizontal plane, and light taut string joining two particles of mass 3m, m lies in the plane ABC so that each particle is in contact with the inclined faces of the wedge. The centroid of the wedges lies in the plane ABC. If the system is released from rest, determine the acceleration of the wedge and the tension in the string.

03. A car of mass 1000kg whose maximum power is constant at all speeds experiences a constant resistance R Newtons. If the maximum speed of the car on horizontal is 120kmh^{-1} and the maximum speed of the slope of angle θ where sinθ = 1/100 is 60kmh^{-1}, calculate the power of the car. Calculate the maximum speed of the car (a) on the horizontal and (b) on the slope when it is pulling a caravan of mass 1000kg if the total resistance to the motion of the car and the caravan is 3R.

04. Two identical smooth spheres A and B are free to move on a horizontal plane. The sphere B is at rest and A is projected with velocity U to strike B directly. B then collides with a vertical wall which is perpendicular to the direction of motion of the spheres. After rebounding from the wall B again collides with A and is brought to rest by this impact. If the coefficient of restitution e has the same value at all impacts prove that e = 1.

05. Two projectiles are fired simultaneously from the point P and Q on the horizontal ground and collide head on when traveling horizontally. The first projectile is fired with speed Vms^{-1} at an angle of elevation α and the second is fired with speed $V/2\ ms^{-1}$ at angle of elevation β.

If $PQ = \frac{v^2 Sin\beta}{2g}$, show that

(a) $\sin\alpha = \sin\beta$
(b) $2 = 2\cos\alpha + \cos\beta$

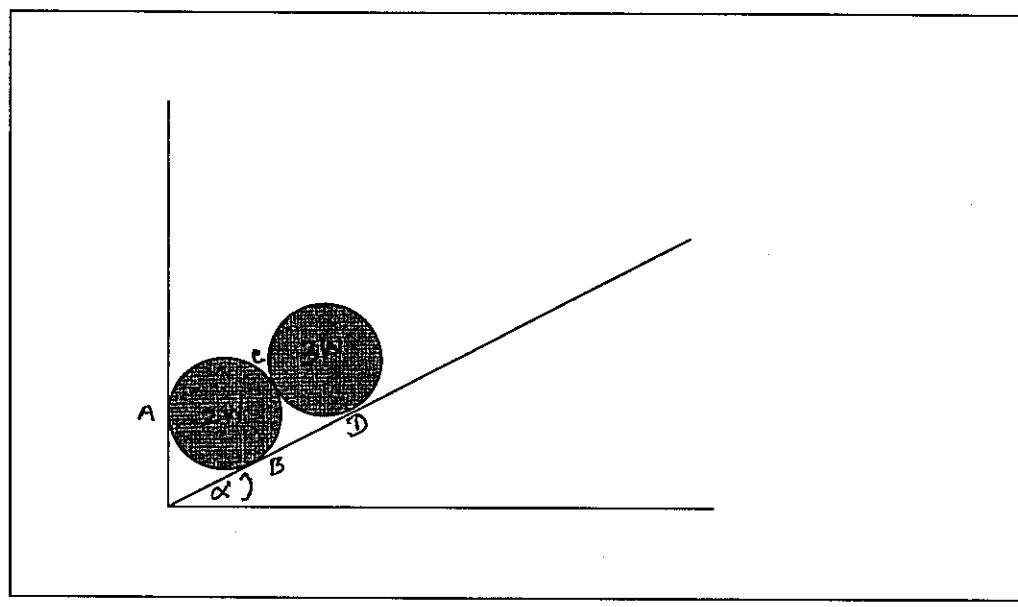
Hence show that $\cos\alpha = 7/8$

06. A uniform rod AB of length 2a and weight W is smoothly pivoted to a fixed point A. Load of weight 2W is attached to the end B. The rod is kept horizontal by a string attached to the mid point C vertically above A. If the length of the string is 2a, find in terms of W, the tension in the string and the magnitude of the reaction at the pivot.

07. Forces of magnitudes 4,3,2,1,P,Q at along the sides. $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CD}, \overrightarrow{AD}, \overrightarrow{AC}, \overrightarrow{BD}$ Respectively of a square ABCD side a.

i. Find P and Q of the resultant acts along AB
ii. Find the magnitude of the resultant if its line of action passes through B and parallel to AC.

08. Two uniform cylinders of equal radius rest against each other on a fixed plane inclined at an angle α t toe horizontal. The lower cylinder resting against a fixed vertical plane. The line of intersection of the planes is perpendicular to the section shown. The lower cylinder has weight 2W and the upper cylinder has weight 3W. Given that all the contacts are smooth, find the magnitudes of the reactions at all points of contact A,B,C and D.



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இலங்கை திறந்த பல்கலைக்கழகம்
விஞ்ஞானத்தில் அடிப்படைப் பாடநெறி
இறுதிப்பரீட்சை 2010/2011
MAF 1302/MAE 1302- பிரயோக கணிதம்– வினாத்தாள் II

காலம் :- **3** மணித்தியாலங்கள்

நாள் :- **15-12-2010** நேரம்:- முப **09.30** – பிப **12.30**

ஐந்து வினாக்களுக்கு மாத்திரம் விடையளிக்குக.

தெரிவிக்கப்படாதவிடத்து, $g = 10\text{ms}^{-2}$ எனக் கருதுக.

1. ஒரு புகையிரதம் சாதாரணமாக, ஒரு நேர்ப் பாதையில் $Ukmh^{-1}$ என்னும் சீர் வேகத்தில் ஓடுகின்றது. பாதையின் முன்னால் பழுதுபார்க்கப்படுவதன் காரணமாக, அது dkm தூரத்துக்குச் சீர் அமர்முடுகலுடன் சென்று $\frac{U}{2}kmh^{-1}$ இற்கு வேகத்தை குறைக்கின்றது. பின்னர், பழுதுபார்க்கப்படும் பாதையில் புகையிரதம் $2dkm$ தூரத்துக்குச் சீர் வேகம் $\frac{U}{2}kmh^{-1}$ உடன் இயங்குகின்றது. பின்பு அது $3dkm$ தூரத்துக்குச் சீர் ஆர்முடுகலுடன் இயங்கி வேகம் $Ukmh^{-1}$ ஐத் திரும்பப் பெறுகின்றது. புகையிரத்தின் இயக்கத்துக்கான வேக–நேர வரைபைப் பரும்படியாக வரைக. புகையிரத்தின் சாதாரண ஓட்டத்துடன் ஒப்பிடும்போது, பாதை பழுதுபார்க்கப்படுவதன் காரணமாக இழந்த நேரம் $\frac{10d}{3U}$ மணித்தியாலங்கள் எனக் காட்டுக.

2. $6m$ திணிவுடைய ஒப்பமான ஆப்பொன்றின் சாதாரணமான குறுக்கு வெட்டு ABC இன் $AB=AC$ மற்றும் கோணம் BAC ஆனது செங்கோணமாகும். BC ஆனது ஒரு கிடை தளத்தை தொட்டவாறு விசையை கொண்டுள்ளது. $3m$, m என்னும் திணிவுடைய இரு துணிக்கைகள் ஒரு உயரமான இழையால் இணைக்கப்பட்டு ஒவ்வொரு துணிக்கைகளும் ஆப்பின் ஒரு சாய்முகத்துடன் தொட்டவாறு ABC என்னும் தளத்தில் கிடக்கின்றன. ஆப்பின் திணிவு மையம் ABC தளத்தில் அமைந்துள்ளது. தொகுதி ஓய்விலிருந்து விடுவிக்கப்பட்டால் ஆப்பின் ஆர்முடுகலையும் இழையின் இழுவையையும் கணிக்க.

3. $1000kg$ திணிவுடைய காரானது அதன் அதியுயர் வலு எந்தக்கதியிலும் மாறிலி. மாறாத்தடை R நீயூட்டன்கள். கிடைத்தரையில் காரின் அதியுயர் கதி $120kmh^{-1}$ மற்றும் θ கோணம் சாய்வில் அதியுயர் கதி $60kmh^{-1}$ ஆகும். இங்கு $\sin\theta = 1/100$ ஆகும். கார் $1000kg$ திணிவுடைய பிரயாண வண்டியை இழுக்கும்போது காரினதும் பிரயாண வண்டியினதும் மொத்தத்தடை $3R$ ஆகுமெனின்,
   (a) கிடையில்
   (b) சாய்வில்
   என்னும்போது காரின் அதியுயர் கதியைக் கணிக்க.[$g = 9.8ms^{-2}$ என எடுக்க.]

4. ஒரேமாதிரியான ஒப்பமான இரு கோளங்கள் A மற்றும் B என்பன கிடைத்தரையில் சுயாதினமாக இயக்கக்கூடியது. B ஆனது ஒய்விலிருக்க A ஆனது B ஐ நேரடியாக அடிக்குமாறு U வேகத்துடன் எறியப்படுகின்றது. பின்னர் B ஆனது நிலைக்குத்தான சுவரொன்றுடன் மோதுகின்றது. B ஆனது சுவரிலிருந்து திரும்பி மீண்டும் A உடன் மோதுகின்றது மற்றும் கணத்தாக்கினால் A ஒய்விற்கு கொண்டுவரப்படுகின்றது. எல்லா கணத்தாக்குகளிலும் மிள்தன்மைக்குணகம் ஒரே பொறுமானத்தைக் கொண்டிருக்குமெனின், $e = 1$ எனக் காட்டுக.

5. கிடைத்தரையிலுள்ள P மற்றும் Q என்னும் புள்ளிகளிருந்து ஒரேநேரத்தில் இரண்டு எவுகணைகள் சுடப்படுகின்றன. கிடையாக பயணிக்கும்போது நேரடியாக மோதுகின்றன. முதலாவது எவுகணை vms^{-1} கதியுடன் α எற்றக்கோணத்தில் சுடப்படுகின்றது மற்றும் இரண்டாவது எவுகணை $\frac{v}{2}ms^{-1}$ கதியுடன் β எற்றக்கோணத்தில் சுடப்படுகின்றது.

$PQ=\frac{v^2\sin\beta}{2g}$ எனின்,

(a) $\sin\alpha=\sin\beta$

(b) $2=2\cos\alpha+\cos\beta$

இதிலிருந்து $\cos\alpha=\frac{7}{8}$ எனக்காட்டுக.

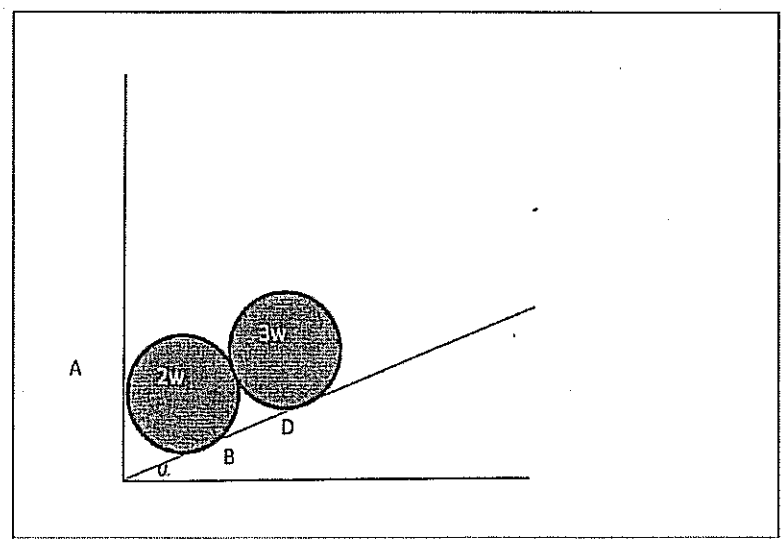
6. W நிறையும் $2a$ நீளமுடைய சீரான கோல் AB ஆனது நிலைத்த புள்ளி A இல் பிணைக்கப்பட்டுள்ளது. முனைவு B இல் $2W$ நிறையுடைய சுமை இணைக்கப்பட்டுள்ளது. கோல் கிடையாக இருக்குமாறு ஒரு இழையினால் நடுப்புள்ளியும் A இற்கு நிலைக்குத்தாக மேலேயுள்ள புள்ளி C உம் இணைக்கப்பட்டுள்ளது. இழையின் நீளம் எனின், இழையிலுள்ள இழுவை மற்றும் பிணைப்பிலுள்ள மறுதாக்கத்தின் பருமன் என்பவற்றை W சார்பில் காண்க.

7. பக்கம் a ஐ நீளமாகக் கொண்ட சதுரம் $ABCD$ இல் $4,3,2,1,P,Q$ ஆகிய பருமன்களைக் கொண்ட விசைகள் முறையே $\overrightarrow{AB},\overrightarrow{BC},\overrightarrow{CD},\overrightarrow{AD},\overrightarrow{AC},\overrightarrow{BD}$ என்னும் ஒழுங்கில் தாக்குகின்றன.

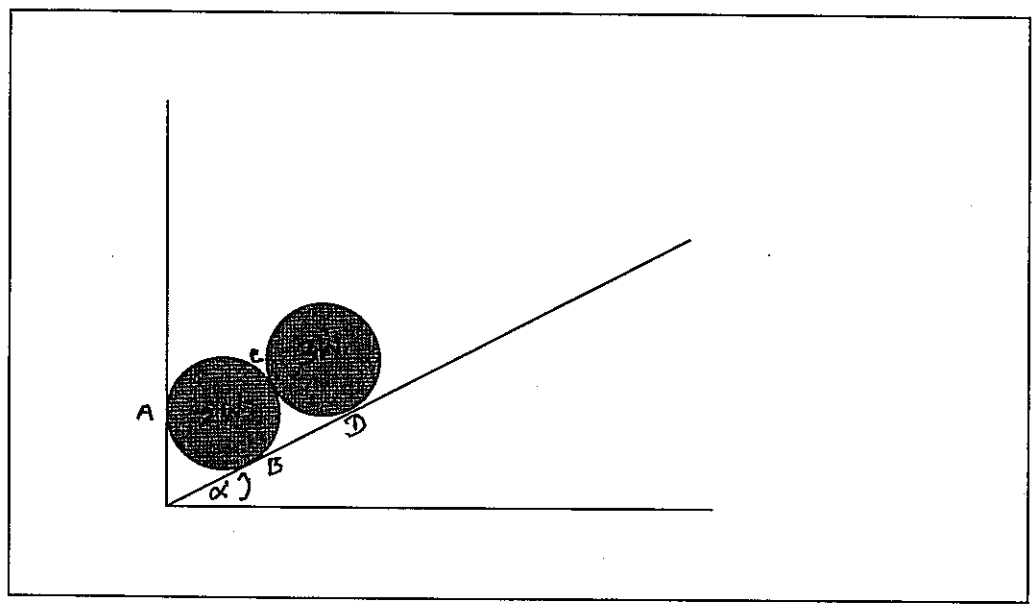
i. விளையுளானது AB வழியே தாக்குமாயின், P மற்றும் Q ஆகியவற்றைக் காண்க.

ii. தாக்கக்கோடானது B இனூடாகச் செல்லுவதுடன் AC இற்குச் சமாந்தரமாகவும் செல்லுகின்றதாயின், விளையுளின் பருமனைக் காண்க.

8. சமமான ஆரைகளைக் கொண்ட இரண்டு உருளைகள் ஒவ்வொன்றும் கிடையாக கோண சாய்வான ஒரு நிலைத்த தளத்திற்கு எதிரே ஒய்விலுள்ளன. கீழே உள்ள உருளை ஒரு நிலைத்த நிலைக்குத்தான தளத்திற்கு எதிரே ஒய்விலுள்ளது. கீழே உள்ள உருளை $2W$ நிறையைக் கொண்டது மற்றும் மேலே உள்ள உருளை $3W$ நிறையைக் கொண்டது. எல்லா தொடுகைகளும் ஒப்பமானவை எனத் தரப்படின் தொடுகையிலுள்ள எல்லா புள்ளிகள் A, B, C மற்றும் D என்பவற்றின் மறுதாக்கங்களின் பருமன்களைக் காண்க



08. Two uniform cylinders of equal radius rest against each other on a fixed plane inclined at an angle α t toe horizontal. The lower cylinder resting against a fixed vertical plane. The line of intersection of the planes is perpendicular to the section shown. The lower cylinder has weight 2W and the upper cylinder has weight 3W. Given that all the contacts are smooth, find the magnitudes of the reactions at all points of contact A,B,C and D.



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