

- a) Given $f(x) = x^4 - x^3 + 3x - 5$, find $f(0)$ and $f(2)$. [10%]
- b) Solve following inequalities and represent the solutions on a number line.
- i. $x > 5x + 8$ [10%]
- ii. $-\frac{2}{3}x - 10 \geq -1$ [10%]

Question 01

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (8)** questions in **Seven (7)** pages.
3. Answer any **Six (6)** questions only. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. This is an Closed Book Test (CBT).
6. Answers should be in clear hand writing.
7. Do not use Red colour pen.

General Instructions

Study Programme	: Bachelor of Industrial studies Honours
Name of the Examination	: Final Examination
Course Code and Title	: AGZ3538/AEZ3238 Mathematics for Agriculture
Academic Year	: 2017/18
Date	: 21 st January 2019
Time	: 1330 - 1630hrs

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Agriculture and Plantation
Engineering



- i. What is the height of the stone from the water level of the river when it is thrown? [20 %]
- ii. How many seconds does it take to hit the water? [20 %]

$$h(t) = -5t^2 + 10t + 15$$

c) A stone is thrown from a bridge that crosses a river. The height of the stone from the water level of the river ($h(t)$) which depends on the time after the throwing (in seconds(t)), can be modeled as,

b) Prove that $2x^2 - 4x + 3 = 0$ has no real roots. [25 %]

iii. $(x + 2)^2 = 2x + 7$, use the formula. [15 %]

ii. $3x^2 + 33x + 30 = 0$, use factorizing method. [10 %]

i. $x^2 + 12x + 32 = 0$, use completing the square method. [10 %]

a) Solve the following quadratic equations.

Question 02

[30 %]

$$2x + y + 2z = 7$$

$$2x - 3y + z = 1$$

$$x + y - z = 0$$

f) Solve the following system of linear equations.

[10 %]

$$3(2x + 8) = 2x$$

e) Solve for x .

[15 %]

$$\frac{x^4 + x^2 + x - 5}{x + 2}$$

d) Find the quotient and the remainder of following expression.

[15 %]

$$3a + 4b + ab - 5ab + 3b + 4a - 7a + 4ab$$

c) Simplify the following algebraic expression and state whether the simplified expression is monomial, binomial or multinomial.

Question 03

a) If $\sin \theta = \frac{5}{13}$, find the value of $\tan \theta$. [20 %]

b) Convert the angle 54° in degrees to radians. [10 %]

c) Convert the angles $\frac{8\pi}{3}$ in radians to degrees. [10 %]

d) Prove that the following trigonometric relationships. [15 %]

i. $\operatorname{cosec}^2 x \cdot \tan^2 x - 1 \equiv \tan^2 x$ [15 %]

ii. $\cos^2 x + 3 \sin^2 x \equiv 3 - 2 \cos^2 x$ [15 %]

e) Evaluate the following values. [15 %]

i. $\sin(\pi - B)$ [15 %]

ii. $\cos\left(\frac{\pi}{2} + A\right)$ [15 %]

Question 04

a) Evaluate the following limits. [10 %]

i. $\lim_{x \rightarrow 0} x^2 + 3x + 8$ [10 %]

ii. $\lim_{x \rightarrow 2} \frac{x^2 - 2x + 3}{x - 2}$ [10 %]

iii. $\lim_{x \rightarrow \infty} \frac{4x}{20x + 18}$ [10 %]

b) Differentiate each of the following functions with respect to x .

i. $y = (3x^2 + 8x + 20)^2$ [15 %]

ii. $y = \sqrt[10]{x^3} \cdot \sin x$ [15 %]

iii. $y = \frac{\sin x}{3x + 5}$ [15 %]

c) Find the stationary (turning) point(s) of the function $y = x^3 + 6x^2 + 9x + 2$. [25 %]

Indicate the maximum point and minimum point.

Question 05

a) Evaluate each of the following integrals.

i. $\int_1^0 3x^2 + 4x + 1 \, dx$

[15 %]

ii. $\int e^x \cdot (3x + 5) \, dx$

[20 %]

Find the area between the curve $f(x) = x + 3x^2$ and the x -axis over the interval $4 \leq x \leq 8$.

[25 %]

b) An object starts from rest and has an acceleration of $a(t) = 6t + 5$, where t is the time in seconds.

i. What is its velocity after 2 seconds?

[20 %]

ii. What is its displacement after 2 seconds?

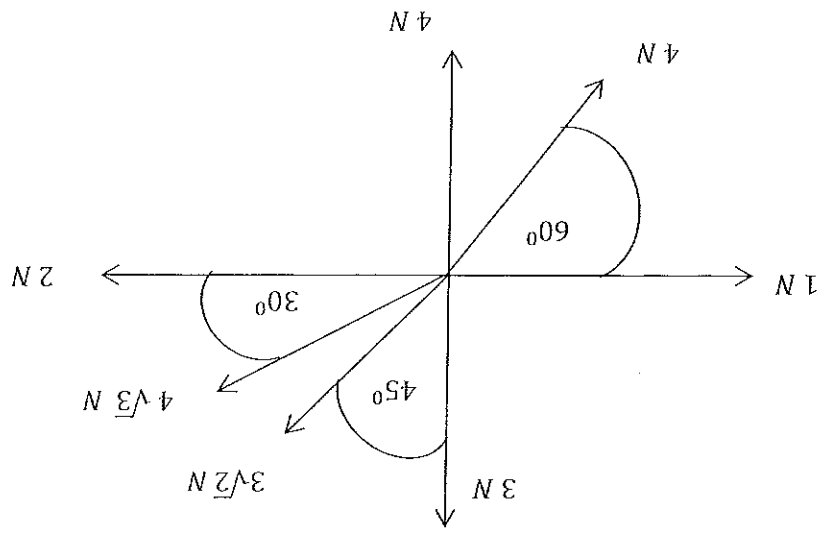
[20 %]

Question 06

a) Two forces of 5 N and 6 N act on a particle. The two forces are inclined at an angle of 60° . Find the resultant force and the angle between the resultant force and 6 N force.

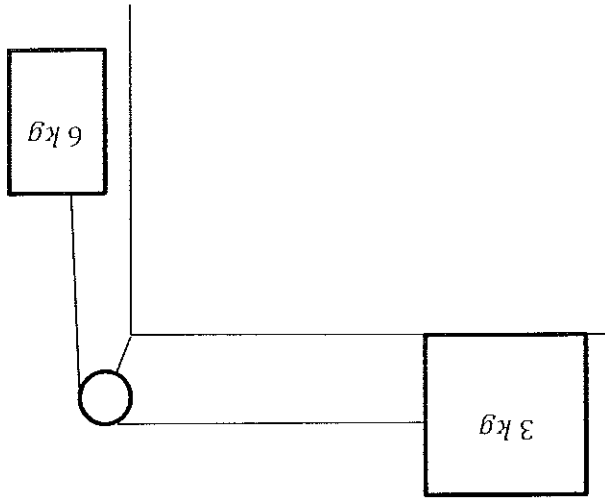
[20 %]

b) Find the resultant force of following series of coplanar forces.



[30 %]

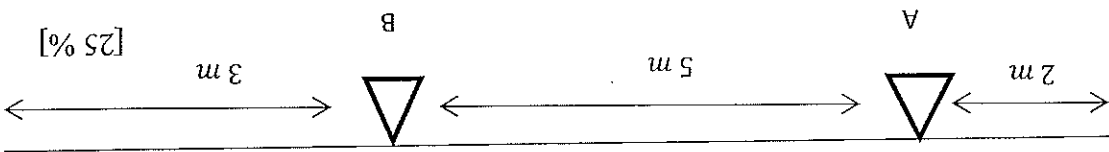
If there is no friction between 3 kg mass and the floor, find the acceleration of the system and the Tension of the thread. [30 %]



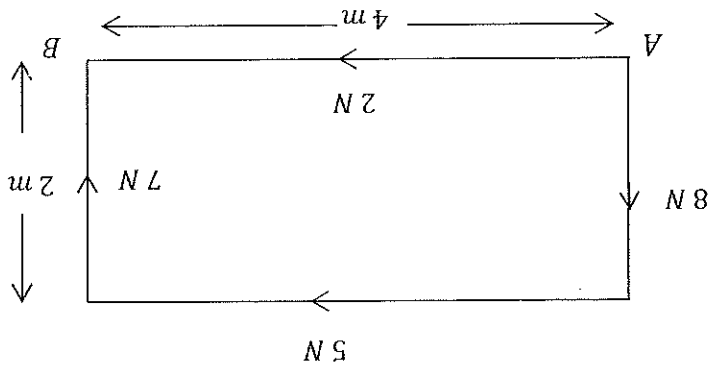
b)

- a) A car starts from 5 ms^{-1} velocity and accelerates uniformly over a time of 5 seconds for a distance of 100 m.
- Find the acceleration of the car. [15 %]
 - Considering the car moves on same acceleration, determine the velocity of the car after 7 seconds. [15 %]

Question 07



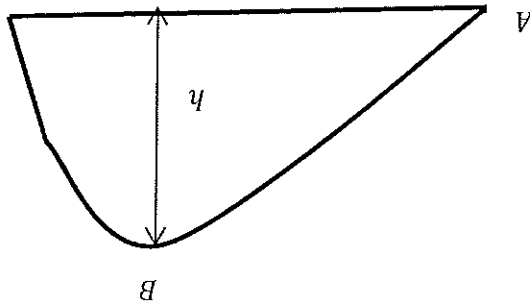
- d) A uniform beam of 2 kg mass rest on supports *A* and *B*. Calculate the reaction forces at *A* and *B*. [25 %]



- c) Find the moment around point *A* and *B* with following series of forces

- b) A driver who drives a car sees an animal crossing the road 30 m ahead and breaks the car with deceleration of -2 ms^{-2} . The car has 200 kg mass and 10 ms^{-1} speed. (Hint: Assume there is no reaction time taken by the driver)
- What is the time taken for stopping the car? [10 %]
 - Find the distance the car moved till stopping after seeing the animal. [15 %]
 - Find the braking force. [10 %]
 - What is the work done by the car engine? [10 %]

- (h).
- Find the initial kinetic energy. [10 %]
 - Find the kinetic energy on the top of the hill. [10 %]
 - Find the kinetic energy loss. [05 %]
 - If loss energy is completely spent for the climbing the hill, find the height of the hill [10 %]



- a) A car of 200 kg mass starts climbing a hill from A with 5 ms^{-1} speed. Its speed is reduced by 2 ms^{-1} when it comes to the top of the hill (B).

Question 08

- c) A force acts on a box of 10 kg and increase its velocity from 5 ms^{-1} to 10 ms^{-1} in 2 seconds.
- Find the acceleration of the box. [10 %]
 - If the coefficient of friction between the box and the floor is 0.5, find the friction act on the box. [15 %]
 - Find the acting force on the box. [15 %]

*****End*****

- c) A box of 10 kg which rests on a soft floor is pulled by a 100 N force. The work done on the box is 500 Nm.
- i. Find the velocity of the box, at the end of 500 Nm work. [10 %]
 - ii. Find the momentum of the box, at the end of 500 Nm work. [10 %]

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