UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF INDUSTRIAL TECHNOLOGY

FINAL EXAMINATION
JANUARY 2016 SEMESTER

COURSE CODE	:	JGB 10103
COURSE TITLE	:	MATHEMATICS
PROGRAMME LEVEL	:	BACHELOR
DATE	:	23 MAY 2016
TIME	:	2:30 PM – 5:30 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consists of TWO (2) sections. Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer THREE (3) questions.
5. Please write your answers on the answer booklet provided.
6. Formulas are enclosed as reference.
7. Please answer all questions in English only.

THERE ARE 4 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

Solve the following linear equations.

(a) $\frac{3}{4}x+\frac{5}{6}=5x-\frac{125}{3}$

(6 marks)

(b) $2(3x-7)+4(3x+2)=6(5x+9)+3$

(4 marks)

Question 2

Two opposite vertices of a rectangle are A(-2, 5) and C(5, -2). Where line AB is parallel to X-axis.

(a) Calculate the gradient of AC

(3 marks)

(b) Find coordinates of points B and D, identify midpoint of AB.

(3 marks)

(c) Evaluate the coordinates for the point which divide BD with the ratio $\frac{1}{3}$.

(4 marks)

Question 3

(a) Point P (3, -4) is on the terminal side of angle θ and θ is positive angle less than 360^0 in standard position. Draw θ and determine the value of six trigonometric functions.

(5 marks)

(b) Given angle $\theta = 405^0$, then find angles $\alpha,\ \beta$ such that $0° < \alpha,\ \beta < 360°$ (where α is co-terminal with θ, β is reference angle with θ), change angles $\alpha,\ \beta$ from degree to radian measure. Then, draw θ.

(5 marks)

Question 4

By using implicit differentiation, determine $\frac{dy}{dx}$ of $x^3y + xy^3 = 2$. Then, determine $\frac{dy}{dx}$ at point $(1,1)$.

(10 marks)

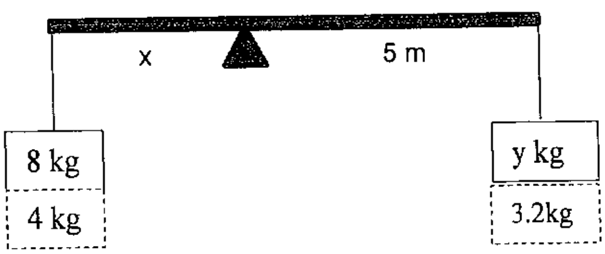
SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

(a) Two forces are applied to the ends of a beam. The force on one end is 8 kg and the force at the other end is not known. The unknown force is 5 m from the centroid; we do not know the distance of the 8-kg force from the centroid. If an additional force of 4 kg is applied to the 8-kg force, the unknown force must be increased by 3.2 kg for equilibrium to be maintained. Find the unknown mass and distance. (See Figure below).



(8 marks)

(b) A ball is thrown upward from the top of a building that is 555 ft high with an initial velocity of 64 ft/s. The height of the ball in feet above the ground at any time t is given by the formula $s(t) = -16t^2 + 64t + 555$. When will the ball hit the ground? Solving this application problem you are required to provide trajectory of the ball (sketch the graph of given quadratic function).

(12 marks)

Question 2

(a) A point (x, y) moves so that its distance from the line $x = 5$ is twice great as its distance from the line $y = 8$. Find an equation of the path of the point.

(10 marks)

(b) Find the equations of lines through $(4, -2)$ and at a perpendicular distance of 2 units from the origin.

(10 marks)

Question 3

These questions are related to Trigonometry and its application.

(a) A straight road makes an angle of 15^0 with the horizontal. At a certain point A on the road, the angle of elevation of a helicopter hovering in the air is 65^0. At this the same time from another point B, 200 m farther up the road, the angle of elevation is 75^0. Find distance from point A to the helicopter. Draw the diagram.

(10 marks)

(b) The length of the three sides of a triangle are AB=5, AC=5, BC=8. Using cosine rule find the measure of each of the three angles to the nearest tenth of a degree. . Illustrate the diagram.

(10 marks)

Question 4

Find the derivative of:

(a) $y = \dfrac{\sqrt{x+2}}{\sqrt{x-1}}$ (10 marks)

(b) $y = \left(\dfrac{x^2 - 2}{2x^2 + 1}\right)^2$ (10 marks)

END OF EXAMINATION PAPER

APPENDIX 1

LIST OF FORMULA

1. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	2. $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
3. $R = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$	4. $P = \left(\frac{nx_1 + mx_2}{2}, \frac{ny_1 + my_2}{2}\right)$
5. $m = \frac{y_2 - y_1}{x_2 - x_1}$	6. $y - y_1 = m(x - x_1)$
7. $y = mx + b$	8. $\sin\theta = \frac{y}{r}$
9. $\cos\theta = \frac{x}{r}$	10. $\tan\theta = \frac{y}{x}$
11. $\frac{\sin a}{a} = \frac{\sin b}{b} = \frac{\sin c}{c}$	12. $a^2 = b^2 + c^2 - 2bc \cdot \cos A$ $b^2 = a^2 + c^2 - 2ac \cdot \cos B$ $c^2 = a^2 + b^2 - 2ab \cdot \cos C$
13. $\frac{d}{dx}(uv) = uv' + vu'$	14. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{vu' - uv'}{v^2}$
15. $\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} \cdot f'(x)$	16. $\frac{d}{dx}(\sin f(x)) = \cos f(x) \cdot f'(x)$
17. $\frac{d}{dx}(\cos f(x)) = -\sin f(x) \cdot f'(x)$	18. $\frac{d}{dx}(\tan f(x)) = \sec^2 f(x) \cdot f'(x)$
19. $\frac{d}{dx}\left(e^{f(x)}\right) = e^{f(x)} \cdot f'(x)$	20. $\frac{d}{dx}(\ln f(x)) = \frac{f'(x)}{f(x)}$

21. $\ln MN = \ln M + \ln N$	22. $\ln \frac{M}{N} = \ln M - \ln N$
23. $k \ln M = \ln M^k$	