Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	ENGINEERING MATHEMATICS I
COURSE CODE	:	BDA 14003
PROGRAMME CODE	:	1BDD
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 An aluminum rod with length 100 cm is divided into two parts to form two pulleys (pulley P and pulley Q) with different radius as shown in **Figure Q1** with $r_1 > r_2$. Then open belt is connected with both pulley at unknown distance, X.

(a) Let L be the total length of the belt. Write L as a function of r_1 if φ=0.1 rad.

(15 marks)

(b) What is the domain and range of the function?

(5 marks)

Q2 A metal ball is dropped into highly viscous liquid in the cylinder container with radius 9 meter, causing ripples in the form of concentric circles. The radius (in cm) of the circle is given by $r(t) = t^2 - 4t + 3$, where t is the time in seconds after marble touch the liquid. The time of t is depend on marble weight (in kg) where $t(w) = w - 5$. The circumference of the circle is given by the function $C(r) = 2\pi(r + 1)$.

(a) Find the circumference of circle in the function of weight $C(w)$.

(5 marks)

(b) What the domain of function $C(w)$?

(13 marks)

(c) What the range of $C(w)$?

(2 marks)

Q3 (a) Find the following limit by using L'Hôpital's rule, and verify your answer using factoring method

$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$$

(6 marks)

(b) A red sports car is traveling, and its position P (in miles) at time t (in hours) is given by $P(t) = t^2 - 7t$.

(i) Find the position when the car is 30 miles from where it started.

(4 marks)

(ii) Determine the velocity at the very moment the car is 30 miles away.

(4 marks)

(iii) Find the acceleration at the very moment the car is 30 miles away.

(3 marks)

(iv) Compute when does the car stop?

(3 marks)

Q4 (a) Evaluate the integral $\int \frac{11x+17}{2x^2+7x-4}\,dx$

(6 marks)

(b) Find $\int \frac{\cos\theta}{sin^2\theta+4\sin\theta-5}\,d\theta$

(6 marks)

(c) Suppose that a particle moving along coordinate line has velocity,
$v\,(t) = 25 + 10e^{-0.05t} ft/s.$
Find the distance traveled by the particle from time t=0 to time t =10

(8 marks)

Q5 (a) A ball is thrown upward with an initial velocity of 64 feet per second from an initial height of 80 feet as shown in **Figure Q5(a)**. Derive the position function giving the height *s* (in feet) as a function of the time *t* (in seconds). Will the ball be in the air f or more than 5 seconds?

(10 marks)

(b) Find $\int_0^{\frac{\pi}{2}} cos^{\,5}x\,dx$

(5 marks)

(c) Find $\int \frac{\cos^3\theta}{\sin^4\theta}\,d\theta$

(5 marks)

Q6 **Figure Q6** shows the curve generated by combination of 2 curves; which is the equation for; The first curve as shown in **Figure Q6(a)** is $y = \frac{x^2}{100} - 50$, while the second curve (**Figure Q6(b)**) is a tangent line of first curve that intersect at x = 20.

(a) Find the total length, *l* (thicken line in **Figure Q6(a)**) of the second curve between the points where x = 60 and x = 20.

(10 marks)

(b) Find the grey surface area, A (**Figure Q6(b)**) generated when the thicken line rotating at ¾ of rotation

(10 marks)

-END OF QUESTIONS –

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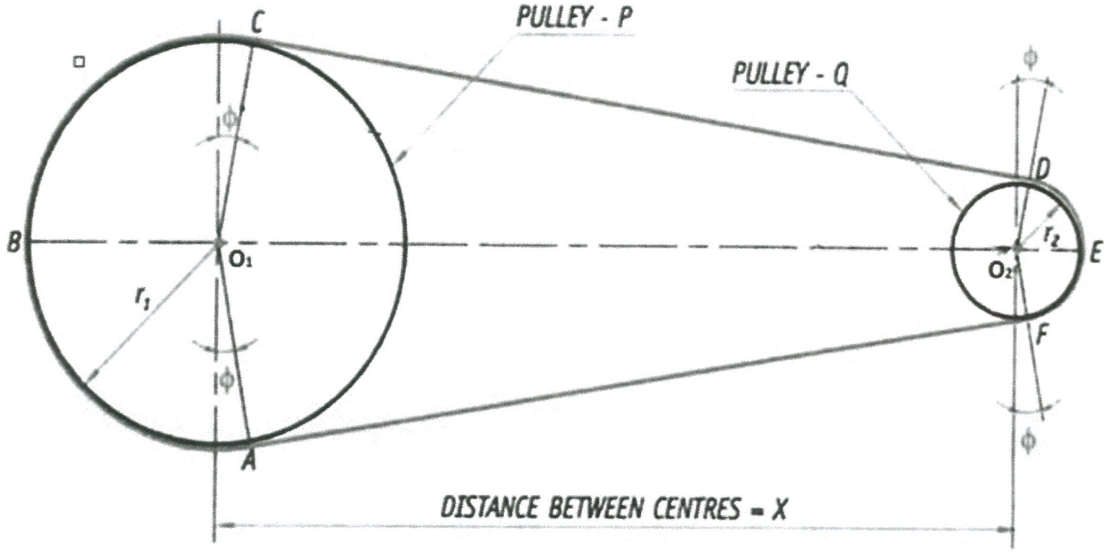

Figure Q1

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$$s(t) = -16t^2 + 64t + 80$$

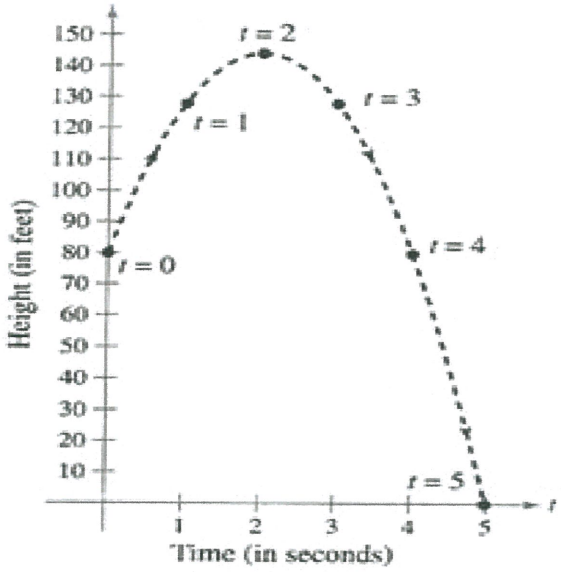

Figure Q5(a)

Pythagorean Identities:

$$sin^2x + cos^2x = 1$$
$$1 + tan^2x = sec^2x$$
$$1 + cot^2x = csc^2x$$

Half-angle Identities:

$$sin^2x = \frac{1 - \cos 2x}{2}$$
$$cos^2x = \frac{1 + \cos 2x}{2}$$

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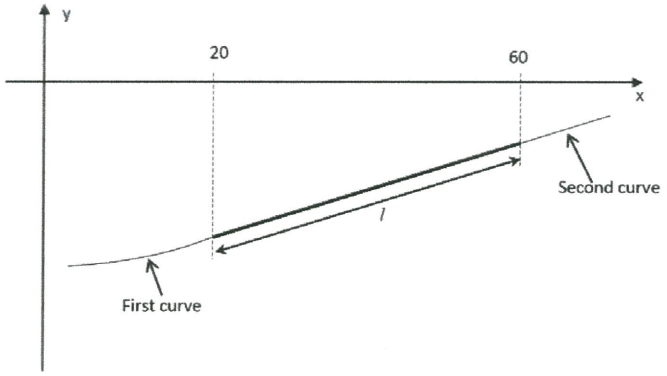

Figure Q6(a)

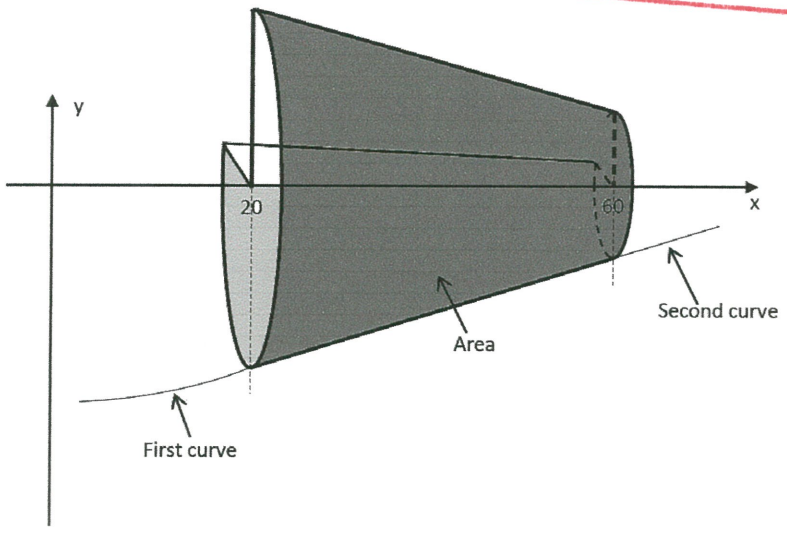

Figure Q6(b)