



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2011/2012**

COURSE NAME : MATHEMATICS 1
COURSE CODE : BWM 11103
PROGRAM : 1 BBE
DATE : JAN 2012
DURATION : 3 HOURS
ARAHAN : ANSWER ALL QUESTIONS
IN PART A AND TWO
QUESTIONS IN PART B

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PRINTED PAGES

PART A

- Q1** (a) Even though the number of tickets sold for a concert decreases with increasing price, the revenue generated does not necessarily decrease. Use the formula $R = p(48000 - 400p)$ to determine the revenue when the price is RM20 and when the price is RM25.

- (i) What price would produce a revenue of RM1.28 million?
 (ii) Use the graph to find the price that determine the maximum revenue.

(6 marks)

- (b) Solve each equation and inequality.

(i) $x^{\frac{1}{2}} - 15x^{\frac{1}{4}} + 50 = 0$.

(ii) $\sqrt{3x + 7x - 30} - x$.

(iii) $\frac{2}{x-2} < \frac{3}{x+1}$.

(iv) $4x(x - 2) < 2(2x - 1)(x - 3)$.

(8 marks)

- (c) Ali can be paid in one of two ways for selling insurance policies.

Plan A: A salary of RM750 per month, plus a commission of 10% of sales.

Plan B: A salary of RM1000 per month, plus a commission of 8% of sales in excess of RM2000.

For what amount of monthly sales is plan A better than plan B if we can assume that sales are always more than RM2000?

(6 marks)

- Q2** (a) Given that B is the inverse of A, find the values of x, y, z .

$$A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 5 & 3 \\ 2 & 4 & 3 \end{bmatrix} \qquad B = \begin{bmatrix} x & 2 & \frac{-11}{6} \\ \frac{3}{5} & -1 & y \\ \frac{-2}{5} & 0 & z \end{bmatrix}$$

(10 marks)

- (b) Haris Manufacturing borrowed RM30,000 to buy a new piece of equipment. Part of the money was borrowed at 8%, part at 10%, and part at 12%. The annual interest was RM3040, and the total amount borrowed at 8% and 10% was twice the amount borrowed at 12%. Using Gaussian elimination method, determine how much was borrowed at each rate?

(10 marks)

- Q3** (a) Solve the following cases:

- (i) If $\sin \alpha = 4/5$ (in Quadrant I) and $\cos \beta = -12/13$ (in Quadrant II), evaluate $\cos(\beta - \alpha)$.
- (ii) Find the exact value of $\cos 75^\circ$ by using $\cos 75^\circ = \cos(30^\circ + 45^\circ)$
- (iii) Solve the equation $\tan 2\theta - \cot 2\theta = 0$ for $0 \leq \theta < 2\pi$.

(10 marks)

- (b) Prove that $\frac{1+\cos x}{\sin x} = \frac{\sin x}{1-\cos x}$

(10 marks)

PART B

- Q4** (a) By referring to Figure Q4(a), find the angle between $\mathbf{u} = (3, 7)$ and $\mathbf{v} = (-4, 2)$.

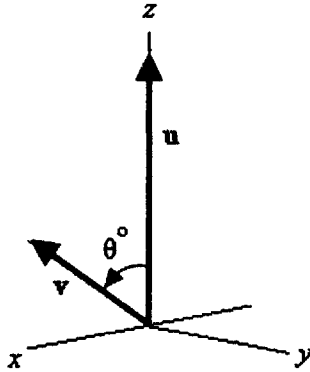


Figure Q4(a)

(2 marks)

- (b) Determine the angle between the following pairs of dot product vectors.

(i) $\mathbf{u} (9, -2)$ and $\mathbf{v} (4, -18)$

(ii) $\mathbf{u} (3, -1, 6)$ and $\mathbf{v} (4, 2, 0)$

(4 marks)

- (c) If $\mathbf{u} (-1, 2, 1)$, $\mathbf{v} (1, -1, -1)$ and $\mathbf{y} (1, 1, -2)$, evaluate

(i) $(\mathbf{u} \times \mathbf{v}) \cdot \mathbf{y}$

(ii) $(\mathbf{u} \times \mathbf{v}) \times \mathbf{y}$

(4 marks)

- (d) Given that $\mathbf{u} (1, -1, 0)$ and $\mathbf{v} (0, -2, 0)$ are vectors in 3-space. See Figure Q4(d). Find the angle between them.

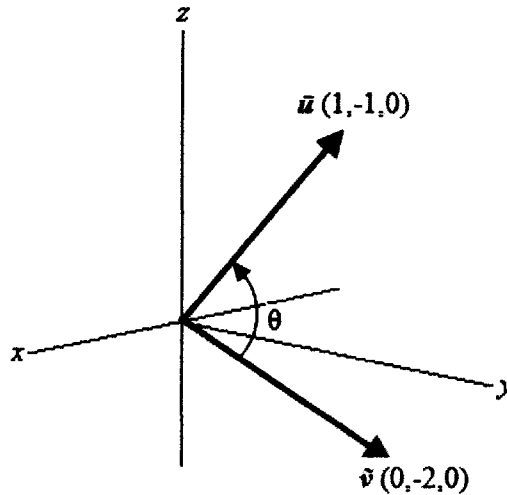


Figure Q4(d)

(4 marks)

- (e) The points $A(1, 1, 1)$, $B(-2, 0, -4)$, $C(1, 2, -3)$ and $D(4, 3, 2)$ are the vertices of a parallelogram. Sketch and find the area of each of the following figures.

(i) Parallelogram $ABCD$.

(ii) Triangle ABC .

(6 marks)

- Q5** (a) If $z = r(\cos \theta + i \sin \theta)$, find $(1 + \sqrt{3} i)^5$.

(2 marks)

- (b) Write in the form $a + bi$.

(i) $(-3 + 6i)(2 - 4i)$.

(ii) $\frac{2 - 3i}{4 - 7i}$.

(4 marks)

- (c) Find the polar form and represent graphically the complex number $7 - 5i$.

(4 marks)

(d) Given the parabola $y^2 + 4y - 4x + 16 = 0$. Find

- (i) the vertex, focus, and directrix of the parabola.
- (ii) sketch the graph of the parabola.

(5 marks)

(e) Solve the system below.

$$\begin{aligned}x^2 + y^2 &= 16 \\y^2 - x^2 &= 4\end{aligned}$$

(5 marks)

Q6 (a) Assume all variables represent positive numbers. Simplify the following expressions

(i) $\left(\frac{x^2}{y^{\frac{1}{2}}}\right)^{-\frac{1}{2}}$.

(ii) $\sqrt[3]{16y^3x^4} - \sqrt[3]{54y^3x^4}$.

(iii) $\frac{-3w-3w^2}{w^2-1}$.

(6 marks)

(b) Solve

(i) $\log(x) + \log(x - 1) = \log(8x - 12) - \log(2)$.

(ii) $(x^2 + 2x)^2 - 11(x^2 + 2x) + 24 = 0$.

(iii) $\log_2(x + 3) + \log_2(x - 3) = 4$.

(6 marks)

- (c) The Department of Irrigation and Drainage (JPS) measures the water height h (in ft above sea level) for the Sembrong River at Parit Raja, and then finds the flow, y (in ft^3 per second), using the formula:

$$y = 114.308e^{0.265(h-6.87)}.$$

Find the flow when the level at Sembrong River is 20.6 ft above sea level.

(8 marks)