


Egypt-Japan University of Science and Technology
Entrance Exam (Undergraduate)

Faculty of Engineering	Subject: Mathematics	 الجامعة المصرية اليابانية للعلوم والتكنولوجيا E-JUST Egypt-Japan University of Science and Technology エジプト日本科学技術大学
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Student Name:	Student ID:	

Choose the correct answer

Question 1 Consider the two points $A(1, -1, 0), B(-2, 1, 2)$. Let \vec{a}, \vec{b} be the position vectors of the two points A, B . Let $\vec{c} = \vec{a} + t\vec{b}$, where t is a real number. $|\vec{c}|^2 =$

- A) $9t^2 + 6t - 2$ B) $9t^2 + 6t + 2$ C) $9t^2 - 6t + 2$ D) $9t^2 - 6t - 2$

Question 2 Given $f(x) = x^2 - 4x + b$, where b is a real number. Let M and m be the maximum and minimum values of $f(x)$ over the interval $a \leq x < 5$, where $0 < a < 5$. For $2 < a < 5$, $(M, m) =$

- A) $(b + 5, a^2 - 4a + b)$ B) $(a^2 + 4a + b, b - 5)$ C) $(b + 4, a^2 - 4a + b)$ D) $(a^2 + 4a + b, b - 4)$

Question 3 Suppose that $f(t) = at^2 + b$ is a quadratic function in t . Let $F(x) = \int_0^x f(t) dt$. If $F(1) = 1, F'(1) = -1$, then $f(t) =$

- A) $3t^2 - 2$ B) $2t^2 + 4$ C) $t^2 + 1$ D) $-3t^2 + 2$

Question 4 Assume that a die is thrown three times. Let x, y, z be the appearing numbers on the first, second and third toss respectively. Define A to be the event where $x = y = z$, and B to be the event where $x + y = z$. The number of elements in B equals

- A) 1 B) 6 C) 15 D) 30

Question 5 Consider the arithmetic sequence $-2, 2, \dots, 4n - 2$. If the sum of this sequence equals 96, then n equals

- A) 8 B) 7 C) 10 D) 9

Question 6 Consider the matrix $C = A + B$, where $A = \begin{pmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{pmatrix}$, and $B = \begin{pmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 2 & 0 & 2 \end{pmatrix}$. What is

the value of $\det(C)$?

- A) 0 B) 20 C) 30 D) 35

Question 7 Evaluate the following integration $\int \frac{3x+5}{e^{2x}} dx$.

- A) $-\frac{1}{4}e^{-2x}(6x + 13) + c$ B) $4e^{-2x}(6x + 13) + c$
 C) $-\frac{1}{4}e^{-2x}(6x - 7) + c$ D) $4e^{-2x}(6x - 7) + c$

Question 8 Evaluate the following integration $\int \frac{x}{\sqrt{x+1}} dx$.

- A) $\frac{2(x+1)^{3/2}}{3} - 2\sqrt{x+1} + c$ B) $\frac{2(x+1)^{3/2}}{3} + 2\sqrt{x+1} + c$
 C) $\frac{2(x+1)^{3/2}}{3} - \frac{2}{\sqrt{x+1}} + c$ D) $\frac{2(x+1)^{3/2}}{3} + \frac{2}{\sqrt{x+1}} + c$

Question 9 How many 3-letter codes can be formed from the letters A, B, C, D, E if no letter may be used more than once?

- A) 15 B) 60 C) 120 D) 125

Question 10 For $f(x) = ax^3 + bx^2$, if $f'(-1) = 8$, and the equation of the tangent line to $f(x)$ at $x = -1$ is $y = 8x + 5$, find the values of a and b .

- A) $a = 2, b = -1$ B) $a = 1, b = -3$ C) $a = -2, b = -2$ D) $a = 1, b = 3$

Question 11 If $y = \left(\frac{x-1}{x+1}\right)^5$, then $\frac{dy}{dx}$ equals to

- A) $\frac{10(x-1)^4}{(x+1)^6}$ B) $5\left(\frac{x-1}{x+1}\right)^4$
 C) $-5\left(\frac{x-1}{x+1}\right)^4$ D) $\frac{2(x-1)^4}{(x+1)^5}$

The force F shown in Figure 1 has two components, one along the positive u -axis of $F_u = 6$ kN and the other along v -axis F_v

Question 12 The magnitude of F is

- A) 8.48 N
 B) 3105.8 N
 C) 5795.6 N
 D) 8485.3 N

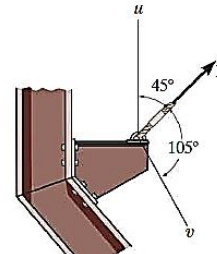


Figure 1

Question 13 The magnitude of its component F_v is

- A) -803.8 N
 B) 5795.6 N
 C) 4392.3 N
 D) d)-1552.91

Question 14 As shown in figure 2, the uniform crate of mass 20 kg is in equilibrium. The force $P = 80$ N is applied to the crate and the resultant normal force N_C acts at a distance x from the crate's center line. The coefficient of static friction is $\mu_s = 0.3$. The friction force F is ...

- A) 58.86 N
- B) 69.3 N
- C) 80 N
- D) 16 N

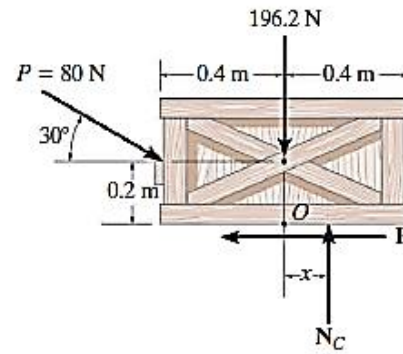


Figure 2

Question 15 A particle moves along a horizontal path with a velocity of $v = (3t^2 - 6t)$ m/s, where t is the time in seconds. If it is initially located at the origin 0, then

The total distance traveled in 3.5 sec. is

- A) 8 m
- B) 6.125 m
- C) 4 m
- D) 14.1 m

Best Wishes for all