| Egypt-Japan University of Science and Technology<br>*Entrance Exam Sample (Undergraduate)* | | |
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| Faculty of Engineering (FoE)- SARCH | Subject: Mathematics | |
| Academic Year: 2022/2023 | No. of Pages: 3 | |
| Exam Duration: 45 minutes | Exam Version: | |
| Student Name: | Student ID: | |

***Choose the correct answer:***

***Question 1*** The first term in the binomial expansion of $(4a + 3b)^3$ is

a) $64a^2$

b) $64a^3$

c) $27b^2$

d) $12a^3$

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***Question 2*** If $x = e^{2t}$, $y = \sqrt{x}$, then $\frac{dy}{dt}$ at $t = 1$ is

a) $e^2$
b) $0$
c) $1$
d) $e$

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***Question 3*** The function $y = 10\cos(2x)$ has a period

a) $2\pi$
*b)* $4\pi$
c) $\pi$
d) $10\pi$

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***Question 4*** The value of $a$ such that the quadratic equation $10x^2 + ax + 40 = 0$ has two negative equal roots is:

a) $-40$
b) $20$
c) $-20$
d) $40$

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***Question 5*** Consider the system of equations $A\boldsymbol{X} = B$, where $A = \begin{bmatrix} 3 & 11 & -2 \\ 0 & 7 & 5 \\ 0 & d+7 & 15 \end{bmatrix}$, $\boldsymbol{X} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, $B = \begin{bmatrix} 5 \\ 2 \\ 6 \end{bmatrix}$. The value of $d$ that makes this system has an infinite number of solutions is

a) $-14$

b) 14
c) 7
d) $-7$

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***Question 6*** The two curves $y = x^2 - 2$ and $y = 2x - 2$ intersect at

a) $(0,2), (2,-2)$
b) $(1,1), (2,4)$
c) $(-2,0), (2,4)$
d) $(0,-2), (2,2)$

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***Question 7*** The value of the integral $\int_0^{2\pi} x \cos 2x \, dx$ is

a) 1
b) 0
c) $-1$
d) $2\pi$

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***Question 8*** The sum of the terms of the infinite sequence $5, -\frac{10}{3}, \frac{20}{9}, -\frac{40}{27}, \ldots$ equals

a) $\frac{1}{3}$
b) 3
c) 6
d) 1

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***Question 9*** The value of the integral $\int_0^2 xe^x \, dx$ is

a) $e^2 + 1$
b) $e^2 - 1$
c) $e - 1$
d) $e + 1$

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***Question 10*** The value of $\lim_{x \to 1} \frac{x-1}{x^3-1}$ is

a) 0
b) $\frac{1}{4}$
c) $\frac{1}{3}$
d) Does not exist

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***Question 11*** If $y = x \cos x$ , then $y'(\pi)$ is

a) 0

b) $\pi$
c) $1$
d) $-1$

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***Question 12*** A function $f(x)$ is called an odd function if
a) $-f(x) = f(-x)$
b) $f(x) = f(2x)$
c) $f(x) = -f(2x)$
d) $f(x) = f(-x)$

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If the resultant force of the two tugboats directed along the positive $x$ − axis, as shown in Figure 1,

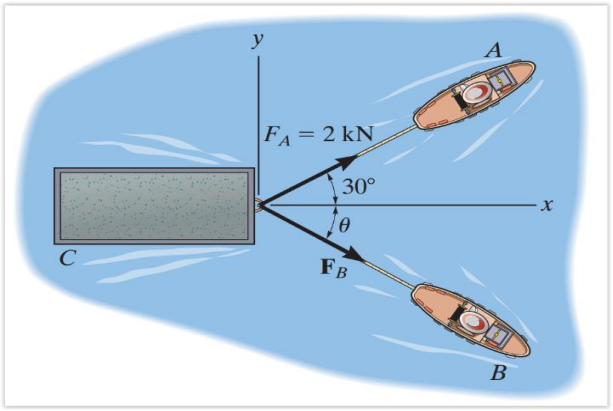


Figure 1

***Question ⑬***
If the resultant magnitude is 3 KN, then the magnitude of the force $F_B$ is:
a) $3 \geq F_B > 2\ KN$
b) $F_B = 2\ KN$
c) $F_B < 2\ KN$
d) $F_B > 3\ KN$

***Question ⑭***
If the force $F_B$ is required to have a minimum value, the angle $\theta$ will be:
a) $\theta = 30°$
b) $\theta = -30°$
c) $\theta = -60°$
d) $\theta = 90°$

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***Question ⑮***
A motorcycle starts from rest at $s = 0$ and travels along a straight road with the speed shown by the $v-t$ graph, see Figure 2,
The position the motorcycle when $t = 15$ seconds is
a) $s = 0\ m$
b) $s = 15\ m$
c) $s = 29\ m$
d) $s = 52.5\ m$

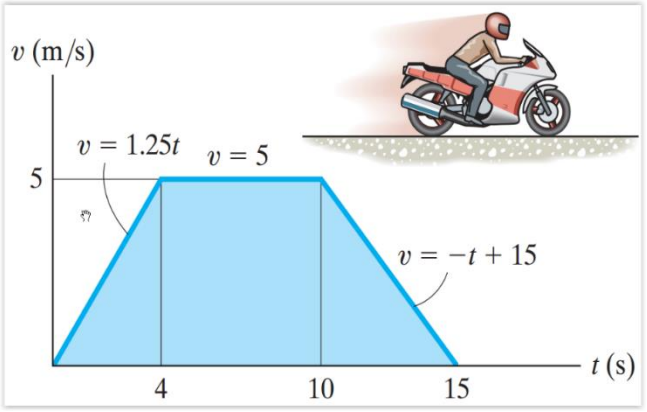


Figure 2

*Best wishes to all*