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**NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES (FAST)**

**Engineering Sample Admission Test 05**

**MATHEMATICS**

**Directions:** For each question below you are given four choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

**ALL ANSWER MUST BE GIVEN ON THE ANSWER SHEET.**

YOUR ANSWERS MUST BE INDICATED BY LETTERS (A, B, C, D) AND NOT BY THE WORDS THEMSELVES.

- The fifth term of the sequence  $a_n = 2n - 3$  is \_\_\_\_\_.
 

A) 13	B) -13
C) 7	D) -7
  
- The harmonic mean between a and b is
 

A) $\frac{a+b}{2}$	B) $\pm\sqrt{ab}$
C) $\frac{a-b}{2}$	D) $\frac{2ab}{a+b}$

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- $\frac{8!}{6!} = \underline{\hspace{2cm}}$ .
 

A) 8	B) $\frac{1}{56}$
C) 56	D) None of these
  
- ${}^{16}C_{11} + {}^{16}C_{10} = \underline{\hspace{2cm}}$ .
 

A) ${}^{16}C_{10}$	B) ${}^{15}C_{11}$
C) ${}^{17}C_{10}$	D) ${}^{17}C_{11}$
  
- In the expansion of  $(a+x)^n$  the sum of exponents of a and x in each term of the expansion is

- A)  $N + 1$                                     B)  $n - 1$   
 C)  $N$     D)  $2n$
6. The number of terms in the expansion of  $\left[ x^2 - \frac{4}{x^2} \right]^9$  is
- A) 8    B) 9  
 C) 10     D) 11
7.  $\cos^2 \frac{\theta}{2} + \sin^2 \frac{\theta}{2} = \underline{\hspace{2cm}}$ .
- A)  $\frac{1}{2}$      B)  $\frac{1}{2}$   
 C) 1     D) None of these
8. The area of a sector of a circular region of radius  $r$  and central angle  $\theta$  radian s is
- A)  $r^2 \theta$     B)  $\frac{1}{2} r^2 \theta$   
 C)  $r \theta$      D)  $\frac{1}{2} r^2 \theta$

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9.  $\cos (2\pi + \theta) = \underline{\hspace{2cm}}$ .
- A)  $\sin \theta$                                          B)  $\cos \theta$   
 C)  $-\sin \theta$                                      D)  $-\cos \theta$
10.  $2 \sin a \cos \beta = \underline{\hspace{2cm}}$ .
- A)  $\cos (a + \beta) - \cos (a - \beta)$             B)  $\cos (a + \beta) + \cos (a - \beta)$   
 C)  $\sin (a + \beta) - \sin (a - \beta)$             D)  $\sin (a + \beta) + \sin (a - \beta)$
11. Period of  $\sin 3x$  is  $\underline{\hspace{2cm}}$ .

A)  $\frac{\pi}{3}$

C)  $\pi$

B)  $\frac{2\pi}{3}$

D)  $2\pi$

12 Range of  $\tan x$  is \_\_\_\_\_ .

A)  $\mathbb{R}$

C)  $\left[-\frac{1}{2}, \frac{1}{2}\right]$

B)  $[-1, 1]$

D) None of these

13  $\sin \frac{a}{2} =$  \_\_\_\_\_ .

A)  $\sqrt{\frac{(s+b)(s+c)}{bc}}$

C)  $\sqrt{\frac{bc}{(s-b)(s-c)}}$

B)  $\sqrt{\frac{(s-b)(s-c)}{bc}}$

D)  $\sqrt{\frac{s(s-a)}{bc}}$

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14 In = radius of  $\Delta ABC$  is

A)  $R = \frac{\Delta}{s}$

C)  $R = \frac{\Delta}{s-b}$

B)  $R = \frac{abc}{4\Delta}$

D)  $R = \frac{abc}{4s}$

15 The solution of the equation  $3 \tan^2 x = 1$  is \_\_\_\_\_ .

A)  $\left\{\frac{\pi}{6} + n\pi\right\} \cup \left\{\frac{5\pi}{6} + n\pi\right\}, n \in \mathbb{Z}$

C)  $\left\{\frac{\pi}{4} + n\pi\right\} \cup \left\{\frac{5\pi}{4} + n\pi\right\}, n \in \mathbb{Z}$

B)  $\left\{\frac{\pi}{3} + 2n\pi\right\} \cup \left\{\frac{2\pi}{3} + 2n\pi\right\}, n \in \mathbb{Z}$

D) None of these

16 If  $f(x) = x^3 - 2x^2 + 4x - 1$  then  $f(0)$  is

- A) 0  
 B) 1  
 C) -1  
 D) None of these

<

17  $F(x) = x$  is

- A) Trigonometric function  
 B) Exponential function  
 C) Quadratic function  
 D) None of these

18  $F(x) = \tan x$  is

- A) Even function  
 B) Odd function  
 C) Linear function  
 D) None of these

19 If  $f$  is a bijective a function then  $f(f^{-1}(x))$  is

- A)  $x$   
 B) 0  
 C) 1  
 D) -1

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20  $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx} = \underline{\hspace{2cm}}$ .

- A) 1  
 B)  $\frac{b}{a}$   
 C)  $\frac{a}{b}$   
 D) None of these

21 If  $f(x) = \tan^{-1} x$  then  $f(\tan x) = \underline{\hspace{2cm}}$ .

- A) 0  
 B) -1  
 C) 1  
 D) 2

22  $\frac{d}{dx} [\tan^{-1} x] = \underline{\hspace{2cm}}$ .

A)  $\frac{1}{x\sqrt{x^2-1}}$

C)  $\sin^2 x$

23  $\frac{d}{dx}(\cosh 2x) = \underline{\hspace{2cm}}$ .

A)  $2 \cos h 2x$

C)  $2 \sin h 2x$

B)  $\sec^2 x$

D)  $\cos^2 x$

B)  $-2 \sin h 2x$

D)  $2 \cot h 2x$

24 If  $f(x) = \tan^{-1} x$  then  $f(\tan x) = \underline{\hspace{2cm}}$ .

A)  $\frac{1}{1+x^2}$

C)  $\sin^2 x$

B)  $\sec^2 x$

D)  $\cos^2 x$

25 The function  $f(x) = 3x^2$  has extreme value at

A)  $X = 1$

C)  $X = 6$

B)  $X = 3$

D)  $X = 0$

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26  $\int \frac{2x-1}{x^2-x+1} dx = \underline{\hspace{2cm}}$ .

A)  $\frac{1}{2}(x^2-x+1)^2 + c$

C)  $\frac{x^3}{3} - \frac{x^2}{2} + x + c$

B)  $\ln(x^2-x+1) + c$

D)  $\ln(2x-1) + c$

27  $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx = \underline{\hspace{2cm}}$ .

A)  $\ln|e^x - e^{-x}| + c$

C)  $E^x + e^{-x} + c$

B)  $\ln|e^x + e^{-x}| + c$

D)  $E^x - e^{-x} + c$

28  $\int e^x \left[ \tanh^{-1} x + \frac{1}{1-x^2} \right] dx = \underline{\hspace{2cm}}$  .

A)  $e^x \tan h^{-1} x + c$

B)  $e^x \cot h^{-1} x + c$

C)  $\frac{e^x}{1-x^2} + c$

D)  $e^x \operatorname{cosec} h^{-1} x + c$

29  $\int_0^2 x^2 dx = \underline{\hspace{2cm}}$  .

A)  $\frac{2}{3}$

B)  $\frac{4}{3}$

C)  $\frac{8}{3}$

D) None of these

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30 The mid point of the line segment joining the points A (-B, 3) an B(2, -1) is

A) (-3, 1)

B) (-6, 2)

C) (5, 2)

D) (-5, 2)

31 the centroid of a triangle divides each median in the ratio

A) 2: 1

B) 3:1

C) 3:2

D) 1:1

32 The point P ( $x_1, y_1$ ) is on the line  $ax + by + c = 0$  if

A)  $Ax_1 + by_1 + c = 0$

B)  $Ax_1 + by_1 + c < 0$

C)  $Ax_1 + by_1 + c > 0$

D) None of these

33 The area of the triangular region with vertices A( $x_1, y_1$ ) B( $x_2, y_2$ ), C( $x_3, y_3$ ) is

A)  $\begin{vmatrix} x_1 y_1 1 \\ x_2 y_2 1 \\ x_3 y_3 1 \end{vmatrix}$

C)  $2 \begin{vmatrix} x_1 y_1 1 \\ x_2 y_2 1 \\ x_3 y_3 1 \end{vmatrix}$

B)  $\frac{1}{2} \begin{vmatrix} x_1 y_1 1 \\ x_2 y_2 1 \\ x_3 y_3 1 \end{vmatrix}$

D)  $\frac{1}{4} \begin{vmatrix} x_1 y_1 1 \\ x_2 y_2 1 \\ x_3 y_3 1 \end{vmatrix}$

34  $X = x$  is in the solution of the inequality

A)  $X > 0$

C)  $X + 3 < 0$

B)  $3x + 4 < 0$

D)  $X - 2 < 0$

35 The line  $y = mx + c$  is tangent to the circle  $x^2 + y^2 = a^2$  if

A)  $C = \pm a\sqrt{1+m^2}$

C)  $C = \pm m\sqrt{1+a^2}$

B)  $C = \pm a\sqrt{1-m^2}$

D)  $C = \pm m\sqrt{1-a^2}$

36 The foci of the ellipse  $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ ,  $a, b$  are

A)  $(\pm c, 0)$

C)  $(\pm a, 0)$

B)  $(0, \pm c)$

D)  $(0, \pm a)$

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37 The length of major axis of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ,  $a > b$  is

A)  $2a$

C)  $2b$

B)  $A$

D)  $B$

38 The position vector of the point  $P(a, b, c)$  is

A)  $\vec{r} = a\hat{i} + b\hat{j} + c\hat{k}$

C)  $\vec{r} = b\hat{i} + a\hat{j} + c\hat{k}$

B)  $\vec{r} = a\hat{i} + c\hat{j} + b\hat{k}$

D)  $\vec{r} = a\hat{i} + b\hat{j} + c\hat{k}$

39 The vectors intersecting at a single point are called

- A) Collinear vectors  
 B) Concurrent vectors  
 C) Perpendicular  
 D) None of these

40 A unit vector along  $2\hat{i} + \sqrt{5}\hat{j} + 4\hat{k}$  is

- A)  $\frac{2}{5}\hat{i} + \frac{\sqrt{5}}{5}\hat{j} + \frac{4}{5}\hat{k}$   
 B)  $\frac{2}{\sqrt{5}}\hat{i} + \hat{j} + \frac{4}{\sqrt{5}}\hat{k}$   
 C)  $\hat{i} + \hat{j} + \hat{k}$   
 D) None of these

### BASIC MATH

1. If  $\frac{4-x}{2+x} = x$ , what is the value of  $x^2 + 3x - 4$ ?

- A. -4                      B. -1                      C. 0                      D. 1                      E. 2

2. If  $b > 2$  and  $2x - 3b = 0$ , which of the following must be true?

- A.  $x > -3$               B.  $x < 2$                       C.  $x = 3$                       D.  $x < 3$                       E.  $x > 3$

3. 
$$\frac{(-1.5)(1.2) - (4.5)(0.4)}{30} =$$

- A. -1.2                      B. -0.12                      C. 0                      D. 0.12                      E. 1.2

4. If  $n$  is a positive integer, then  $n(n+1)(n+2)$  is

- A. Even only when  $n$  is even  
 B. Even only when  $n$  is odd  
 C. Odd whenever  $n$  is odd  
 D. Divisible by 3 only when  $n$  is odd  
 E. Divisible by 4 whenever  $n$  is even

5. If Jack had twice the amount of money that he has, he would have exactly the amount necessary to buy



- 3 hamburgers at \$0.96 apiece and 2 milk shakes at \$1.28 apiece. How much money does Jack have?
- A. \$1.60      B. \$2.24      C. \$1.72      D. \$3.36      E. \$5.44
6. If a photocopier makes 2 copies in  $\frac{1}{3}$  seconds, then at the same rate, how many copies does it make in 4 minutes?
- A. 360      B. 480      C. 576      D. 720      E. 1.440
7. The price of a certain television set is discounted by 10 percent, and the reduced price is then discounted 10 percent. This series of successive discounts is equivalent to a single discount of
- A. 20%      B. 19%      C. 18%      D. 11%      E. 10%
8. If  $\frac{2}{1+\frac{2}{y}} = 1$ , then  $y =$
- A. -2      B.  $-\frac{1}{2}$       C.  $\frac{1}{2}$       D. 2      E. 3
9. If a rectangular photograph that is 10 inches wide by 15 inches long is to be enlarged so that the width will be 22 inches and the ratio of width to length will be unchanged, then the length, in inches, of the enlarged photograph will be
- A. 33      B. 32      C. 30      D. 27      E. 25
10. If  $m$  is an integer such that  $(-2)^{2m} = 2^{9-m}$ , then  $m =$
- A. 1      B. 2      C. 3      D. 4      E. 6

## PHYSICS

**Directions:** For each question below you are given four choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

**ALL ANSWER MUST BE GIVEN ON THE ANSWER SHEET.**

**YOUR ANSWERS MUST BE INDICATED BY LETTERS (A, B, C, D) AND NOT BY THE WORDS THEMSELVES.**

- Physics is the study of  
 a Matter (b) Energy (c) Relation between matter & energy (d) All of the above
- The branch of physics which deals with the properties, and interaction of nuclear particles (protons and neutrons) is called  
 ( a Molecular physics (b) Plasma physics (c) Nuclear physics (d) Solid state physics )
- When comparing systematic and random errors, the following pairs of properties of errors in an experimental measurement may be contrasted:  
 P<sub>1</sub> : error can possibly be eliminated  
 P<sub>2</sub> : error cannot possibly be eliminated  
 Q<sub>1</sub>: error is of constant sign and magnitude  
 Q<sub>2</sub> : error is of varying sign and magnitude  
 R<sub>1</sub> : error will be reduced by averaging repeated measurements  
 R<sub>2</sub> : error will not be reduced by averaging repeated measurements  
 Which properties apply to random errors?  
 A ) P<sub>1</sub>, Q<sub>1</sub>, R<sub>2</sub> B) P<sub>2</sub>, Q<sub>2</sub>, R<sub>1</sub> C) P<sub>1</sub>, Q<sub>2</sub>, R<sub>2</sub> D) P<sub>2</sub>, Q<sub>1</sub>, R<sub>2</sub>
- In a simple electrical circuit, the current in a resistor is measured as  $(2.50 \pm 0.05)$  mA. The resistor is marked as having a value of  $4.7\Omega \pm 2\%$ . If these values were used to calculate the power dissipated in the resistor, what would be the percentage uncertainty in the values obtained?  
 A ) 2% B) 4% C) 6% D) 8%
- The dimension of a cube are measured with vernier calipers. The measured length of each side is 30 mm. If the vernier calipers can be read with an uncertainty of  $\pm 0.1$  mm, what does this give for the approximate uncertainty in the value of its volume?

- A ) 1/27 %                      B) 3/10 %                      C) 1/3 %                      D) 1%
6. An alternative form of the unit of resistance, the ohm is  $V A^{-1}$   
Which of the following example shows a similar correct alternative form of unit?  
A ) coulomb (C)  $As^{-1}$     B) farad (F)  $VC^{-1}$     C) Pascal (Pa)  $N m^{-2}$     D) volt (V)  $J C$
7. Which of the following quantities has a unit that can be expressed in terms of just two different SI base units? (E) resistance  
A ) area                      B) charge                      C) current                      D) force
8. The base units of the SI system include those of  
Mass, kg; length, m; time, s; electric current, A.  
Which base units would be needed to express the SI unit of potential difference (the volt)?  
A ) kg and A only    B) kg, m, s, and A    C) s and A only    D) m, s, and A
9. The unit of luminous intensity in SI system of units is  
(a) Ampere                      (b) Mole                      (c) Candela                      (d) Kelvin
10. The fundamental unit of angle in a plane in SI system of units is called  
(a) Rotation                      (b) Degree                      (c) Radian                      (d) Cycle

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11. What is the unit of power of a lens?  
(a) Angstrom                      (b) Cycle                      (c) Newton                      (d) Dioptr
12. Significant figures in 0.0001 are  
(a) One                      (b) Two                      (c) Three                      (d) Four
13. The dimensions of frequency are  
(a) LT                      (b)  $LT^{-1}$                       (c)  $MT^{-1}$                       (d)  $T^{-1}$
14. What is the number of significant zeros in 0.00112?  
(a) Zero                      (b) One                      (c) Two                      (d) Three

15. A scalar is a physical quantity which is completely specified by  
 (a) Direction only (b) Magnitude only (c) Both magnitude & direction (d) None of these
16. Which of the following is a scalar quantity  
 (a) Density (b) Displacement (c) Torque (d) Weight
17. Which of the following is the only vector quantity  
 (a) Temperature (b) Energy (c) Power (d) Momentum
18. Which of the following lists of physical quantities consists only of vectors:  
 (a) Time, temperature, velocity (b) Force, volume, momentum  
 (c) Velocity, acceleration, mass (d) Force, acceleration, velocity
19. The rectangular components of a vector have angle between them  
 (a)  $0^\circ$  (b)  $60^\circ$  (c)  $90^\circ$  (d)  $120^\circ$
20. A force of 10N is acting along y-axis. Its component along z-axis is  
 (a) 10N (b) 20N (c) 100N (d) Zero N

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## ENGLISH

**Directions:** For each question below you are given choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

### SENTENCE COMPLETION

#### Directions for Q 1 - 3

Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath in sentence are five lettered words or sets of words. Choose the word or set of words that best fits the meaning of the sentence as a whole.

1. The selection committee for the exhibit was amazed to see such fine work done by a mere \_\_\_\_\_.
- |                  |                 |
|------------------|-----------------|
| A. Connoisseur   | B. Artist       |
| C. Amateur       | D. Entrepreneur |
| E. Exhibitionist |                 |

2. The teacher suspected cheating as soon as he notice the pupil's \_\_\_\_ glances at his classmate's paper.
- |                    |             |
|--------------------|-------------|
| A. Futile          | B. Sporadic |
| C. Furtive         | D. Cold     |
| E. Inconsequential |             |
3. Known for his commitment to numerous worthy causes, the philanthropist deserved \_\_\_\_ for his \_\_\_\_.
- |                         |                                 |
|-------------------------|---------------------------------|
| A. Recognition....folly | B. Blame....hypocrisy           |
| C. Reward....modesty    | D. Admonishment....wastefulness |
| E. Credit....altruism   |                                 |

## ANALOGIES

**Direction:** Each question below consists of a related pairs of words or phrases, followed by five lettered pairs of words or phrases, Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

4. FISH : SCALES ::
- (a) plane : wings
  - (b) bird : feathers
  - (c) cat : claws
  - (d) snake : fangs
  - (e) song : notes

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5. FISH : SCHOOL ::
- (a) book : education
  - (b) team : practice
  - (c) dog : sled
  - (d) bear : lair
  - (e) lion : pride
6. CLOCK : TIME ::
- (a) watch : wrist
  - (b) odometer : speed
  - (c) hourglass : sand
  - (d) yardstick : distance

- (e) radio : sound
7. DOCTOR : DISEASE ::
- (a) moron : imbecility
  - (b) pediatrician : senility
  - (c) psychiatrist : maladjustment
  - (d) broker : stocks
  - (e) charlatan : truth

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(f)

### **ANTONYM**

**Direction:** In each of the following antonym questions, a word printed in capital letters precedes five lettered words or phrases. From these five lettered words or phrases, pick the one most nearly opposite in meaning to the capitalized word.

8. MERRY:  
(A) Sad (B) Melancholy (C) Defy (D) Willing
9. MITIGATION:  
(A) Obscenity (B) Aggravation (C) Restriction (D) Interregnum
10. NEFARIOUS:  
(A) Benign (B) Various (C) Lacking (D) Pompous

## END OF TEST

**For Answer Key:**

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