UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE
Engineering College Admission Test (ECAT) – 2018

Instructions:

- **Total Marks: 400**
- **Total Time Allowed: 100 Minutes**
- **Each Incorrect MCQ deducts -1 point**
- **Each Correct MCQ earns: 4 marks**

Note: Possible Correct Answers are bolded below

MATHEMATICS

1) Two large pumps and one small take 4 hours to full a water tank. One large and three small pumps also take 4 hours to full it. How long will two large pumps and two small pumps take to full the water tank?

A) 2 hours B) 4 hours
C) Between 3 and 4 hours D) More than 4 hours

2) A circle with the radius 3.5 units and center (-3,-4) will lie in the region:

A) x < 0, y < 0 B) x < 0 C) x < y **D) y < 0**

3) Let $y = x^x$, then dy/dx is:

A) x^x B) $x^x lnx$ C) $x^x + lnx$ **D) $x^x + x^x lnx$**

4) $\int \frac{\cos^2 x}{1+sinx} dx$

A) $x + cosx + c$ B) $sin2x - cosx + c$
C) $sin2x.cosx + c$ D) $x - sinx + c$

5) The following system of equations has _____.

$$4x + y = -3$$
$$8x + 2y = -6$$

A) One solution B) Two solutions
C) No solution **D) Indefinitely many solutions**

6) A square has an area of 400 cm^2. A circle is inscribed inside a square. A smaller square is then inscribed inside the circle. The side of the smaller square equals to:

A) $\sqrt{10}\ cm$ **B) $10\sqrt{2}\ cm$** C) $10\ cm$ D) $2\sqrt{10}$

7) If the average of numbers x, y, z and w is 30 and the average of x, y and z is 32. Then w equals to

A) -24 B) 32 C) -2 **D) 24**

8) If $f(x) = 3x^2 - 7x - 5$ then $f(x-2)$ is equal to:

A) -7 **B) $3x^2 - 19x + 21$**
C) $3x^2 - 7(x-2) - 5$ D) $3x^2 + 12x - 5$

9) Let x be a real number and $h(x) = x^2 - 4x + 9$. By completing the square, we can find the range of function h(x) which equals to:

A) $[9, \infty)$ **B) $[5, \infty)$**
C) $(-\infty, \infty)$ D) $[0, \infty)$

10) The inequality $43 < 8x + 3 \leq 99$ is the same as:

A) $-5 < x \leq 2$ **B) $5 < x \leq 12$**
C) $-8 < x \leq 29$ D) $6 < x \leq 9$

11) One positive number is 5 timers another positive number. The difference between the two numbers is 36. The two numbers are:

A) 54 and 9 B) 40 and 8 **C) 45 and 9** D) 47 and 8

12) The midpoint between two points (-13, 22) and (1,26) is:

A) (-5,23) B) (-7,25) C) (-12,24) **D) (-6,24)**

13) $3^{-2}/4^{-4}$ is equal to

A) 9 **B) 256/9** C) 12 D) 9/256

14) $(-1 - 3i)(-7 + i) =$

***Paper shared* by**
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Director, *The Ambitious Educational System*

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A) $-57+44i$ B) $51+63i$ C) $10+20i$ **D) None of these**

15) $\frac{10-4i}{2i}=$

A) $-2+5i$ **B) $-2-5i$** C) $2+5i$ D) None of these

16) Two angles X and Y are measured in degrees. If $\sin(X+Y)=1$ and $\sin(X-Y)=0.5$ then X and Y respectively are:

A) 60 degrees and 45 degrees B) 45 degrees and 30 degrees

C) 90 degrees and 0 degree **D) 60 degrees and 30 degrees**

17) The sum of infinite series as given below, is:

$$1-\frac{1}{3}+\frac{1}{3^2}-\frac{1}{3^3}+\frac{1}{3^4}\ldots\ldots$$

A) $\frac{3}{2}$ **B) $\frac{3}{4}$** C) $\frac{9}{8}$ D) None of these

18) $\sqrt{6\frac{1}{4}}$ is equal to

A) $\frac{\sqrt{6}}{2}$ B) $2\sqrt{6}$ **C) 2.5** D) None of these

19) A car uses 10 liters of fuel to travel a distance of 160 km. If its fuel efficiency is 20 km/liter on motorway and 10 km/liter on city roads. How much fuel did it use on the motorway?

A) 6 Liters B) 4 Liters C) 5 Liters D) 5.5 Liters

20) When x^5+2x^3+Ax+B is divided by $(x-1)$ the remainder is -3. Then values of A and B is:

A) -3 and 2 B) 1 and 0 C) 0 and 0 **D) 2 and -3**

21) The curves given by $(x-2)^2+(y-2)^2=4$ and $x^2+y^2-4=0$ intersects at the points:

A) (2,0) and (0,2) B) (0,0) and (2,2) C) (2,0) and (0,0) D) (0,2) and (0,-2)

22) There are eleven balls numbered 1 and 11 in a box. A ball is randomly drawn and then put back in the box. Then a second ball is randomly drawn. The probability that both balls drawn are even numbered, is:

A) $20/121$ B) $36/121$ **C) $25/121$** D) $30/121$

23) Two lines A and B are perpendicular. Line A has a slope of 5 while line B passes through points (5, 1) and (-5, y). The value of the y is:

A) 3 B) -1 C) 0 D) 5

24) $\int_5^6 \frac{6}{x^2-9}dx=$

A) $\ln(3)$ **B) $\ln\left(\frac{4}{3}\right)$** C) $\ln\left(\frac{3}{4}\right)$ D) $\frac{27}{16}$

25) If $y=sin\sqrt{x}$ then $\frac{dy}{dx}=$

A) $\frac{\sqrt{x}cos\sqrt{x}}{2}$ B) $\frac{cos\sqrt{x}}{2}$ C) $\sqrt{x}cos\sqrt{x}$ **D) $\frac{cos\sqrt{x}}{2\sqrt{x}}$**

26) The shortest distance from the origin to the line $y+2x=2$ is:

A) $4/5$ B) $\sqrt{5}$ C) $\sqrt{5}-2$ **D) $\frac{2}{\sqrt{5}}$**

27) The line y=x-2 will intersects the curve $y=4x^2$ at:

A) (0,2) B) (0,-2) C) (2,2) **D) None of these**

28) Let $y=a^x$ where '**a**' is positive constant and not equal to 1. Then dy/dx=

A) xa^{x-1} **B) $a^x lna$** C) $xlna$ D) a^x

29) If $|x-1|<5$ then value of x is:

A) $-5<x<5$ B) $0<x<5$ **C) $-4<x<6$** D) $5<x<\infty$

30) One question from Mathematics Portion is missing in the records.

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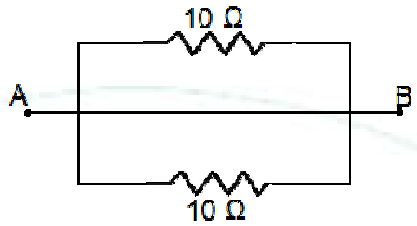
PHYSICS

31) Find the equivalent resistance of the following parallel electrical network as shown below:



A) 0 Ω B) 5 Ω C) 20 Ω D) 10 Ω

32) Which of the following experimental techniques reduces the systematic error of the quantity being investigated?

A) Timing a large number of oscillations to find a period

B) Measuring several intermodal distances on standing wave to find mean intermodal distance.

C) Measuring the diameter of a wire repeatedly and calculating the mean

D) Adjusting an ammeter to remove its zero error before measuring a current

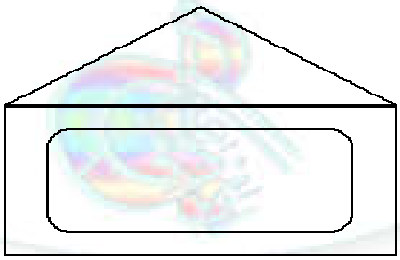
33) In an experiment, the average speed of a car is measured. GPS localization is used to measure distance travelled over an interval of 10 seconds. For this purpose, a stop watch with an absolute uncertainty of 0.1 s and a GPS device with a location uncertainty of 3m are used. If the difference in location using GPS before and after the experiment is 60m, the percentage uncertainty in the measurement of average speed of the car is:

A) 4% **B) 6%** C) 9% D) 11%

34) If F, C, J, N and m represent farad, coulomb, joule , newton and meter respectively then permittivity of free space ε_o has units:

A) Fm^{-1} B) $C^2N^{-1}m^{-2}$ C) $C^2J^{-1}m^{-1}$ **D) All of the above**

35) A heavy picture frame is to be hung on a wall as shown in figure below. Assume that the two points on the frame for attaching the strings are fixed. Which of the following statement is correct?



A) Longer length of string should be used to ensure that the string is less likely to break

B) Shorter length of string should be used to ensure that the string is less likely to break

C) The likelihood of the string breaking does not depend on the length of the string

D) None of the above

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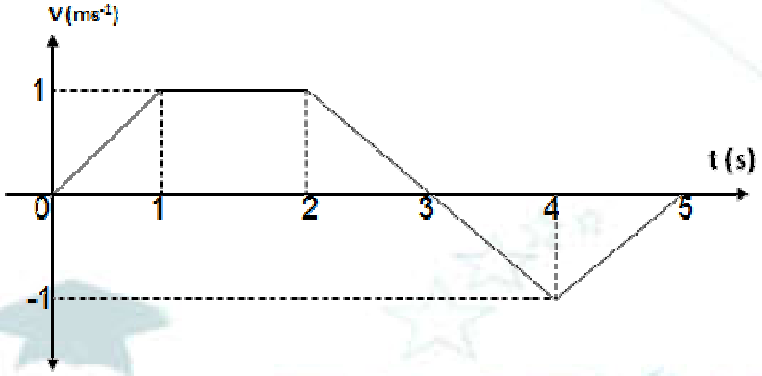
36) Two objects A and B at a distance of 100m travel towards each other, both with initial speed of 10 m/s and constant acceleration of 1m/s^2 and 1.5 m/s^2 respectively. After how much time will the objects cross each other.

A) 3 sec B) 3.5 sec **C) 4 sec** D) 4.5 sec

37) When a constant force of 5 N acts on an object of unknown mass for a time of 5 seconds, the change in velocity of the object is 5m/s. What is the mass of object?

A) 5 kg B) 1 kg C) 10 kg D) 25 kg

The following graph shows the velocity variation of an object of mass 2kg over an interval of 5 seconds. Answer **next THREE** questions using this graph.



38) The accelerations of the object at time instants 0.5s, 1.5s, 3s and 4.5s are:

	Object acceleration in ms^{-2} at time instants			
	0.5 s	**1.5 s**	**3 s**	**4.5 s**
A)	0	1	-1	0
B)	**1**	**0**	**-1**	**1**
C)	1	1	-1	1
D)	1	1	-1	1

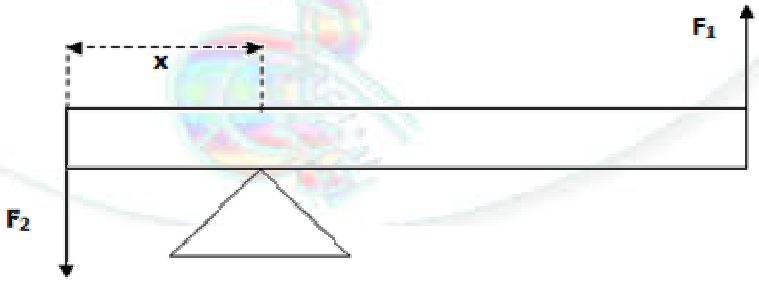
39) Total displacement travelled during the 5 seconds interval is:

A) 0.5 m **B) 1 m** C) 2 m D) 3 m

40) Work done required to move the object during the time interval from 0 to 2 seconds is:

A) 0 J **B) 1 J** C) 2 J D) 4 J

41) A uniform rod of length 1m with unknown weight 'W' is pivoted at a distance x from the edge. It is observed that the system is in equilibrium when a force F_1 equals to 1 newton and F_2 equals to 3 N are applied on the system as shown in the given figure below.



The weight of the rod 'W' and distance 'x' are:

A) x=0.5 m and W=1 N **B) x=0.3 m and W=8 N**

C) x=0.75 m and W=3 N D) Both B & C are correct

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42) In an experiment, fluid flowing through a pipe is to be studied. Under which of the following is the Bernoulli's equation not applicable?

A) Fluid flowing through pipe is viscous
B) Fluid flowing through pipe is non-compressible
C) Fluid motion steady
D) Pipe is not horizontal

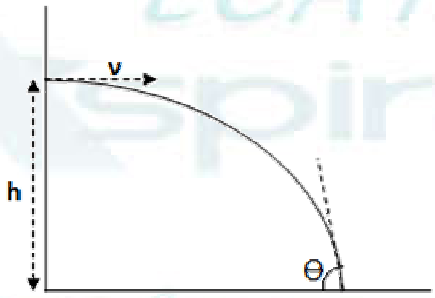
43) Geostationary satellites A and B of masses 10 kg and 20 kg respectively, are to be put into orbit. Which of the following statements is not correct?

A) Both satellites will be put into same orbital radius
B) Both satellites have the same orbital speed
C) Both satellites will have same centripetal force
D) Both satellites will have different angular momentum

44) Two cricket balls collide in-elastically, what happens to the kinetic energy and momentum?

	Kinetic Energy	**Momentum**
A)	Conserved	Conserved
B)	Conserved	Reduced
C)	**Reduced**	**Conserved**
D)	Reduced	Reduced

45) A projectile is fired with horizontal velocity 'v' from the help of a cliff of height h as shown in the figure below:



Which of the following pairs of the values of v and h will give the greatest value of angle θ?

	v (ms^{-1})	**h (m)**
A)	20	30
B)	**20**	**50**
C)	40	30
D)	40	50

46) The maximum speed of a car rounding a corner is v when the road is dry. If it is unknown that the maximum frictional force between the road and wheels is halved when the road is wet. What is the maximum safe speed for rounding the corner in wet condition?

A) $v/4$ B) $v/2\sqrt{2}$ C) $v/2$ **D) $\boldsymbol{v/\sqrt{2}}$**

47) A pendulum bob in simple harmonic motion will have its velocity leading the displacement by a phase angle of:

A) $0\ rad$ B) $\frac{\pi}{4} rad$ **C) $\boldsymbol{\frac{\pi}{2} rad}$** D) $\pi\ rad$

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48) A suspension bridge is to be built across a river where the wind is found to gust at five seconds intervals. The speed of a transverse wave along the span of bridge is estimated to be 400 m/s. The bridge will resonate at its fundamental frequency if its length is:

A) 2000 m **B) 1000 m** C) 400 m D) 80 m

49) Under which conditions will the fringe separation for a double slit interference pattern be at maximum?

	Slit separation	Distance of screen from the double slits	Wavelength of the light
A)	**Small**	**Large**	**Long**
B)	Small	Large	Short
C)	Small	Small	Short
D)	Large	Small	Long

50) A compound microscope and an astronomical telescope each consists of two converging lens. In which of following ways is the telescope similar to the microscope when both are in normal adjustment?

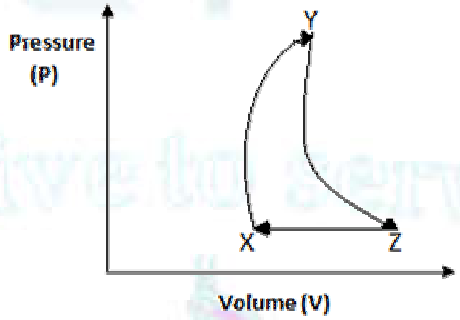
A) Each has objective lens of long focal length

B) In each, the final image is inverted and virtual

C) In each, the separation of the lens is equal to sum of their focal lengths

D) In each the final image is in the focal plane of the instrument's eyepiece.

51) A fixed mass of an ideal gas undergoes the changes represented by $X \rightarrow Y \rightarrow Z \rightarrow X$ as shown below:



Which one of the following sets could describe the set of changes?

	XY	YZ	ZX
A)	Isothermal Compression	Adiabatic Expansion	Pressure reduction at constant volume
B)	Isothermal Compression	Adiabatic Expansion	Compression at constant pressure
C)	Adiabatic Compression	Isothermal Expansion	Pressure reduction at constant volume
D)	**Adiabatic Compression**	**Isothermal Expansion**	**Compression at constant pressure**

52) Two small conducting spheres S_1 and S_2 of same weights hang from light insulating strings of same length from points P_1 and P_2 which are on the same level. S_1 has charge Q while S_2 has charge 2Q. Repulsive force between S_1 and S_2 causes their strings to be inclined at θ_1 and θ_2 to vertical respectively. What is the ratio of $sin\theta_1/sin\theta_2$?

A) 2.0 **B) 1.0** C) 0.5 D) 2.5

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53) Which of the following statement is correct?

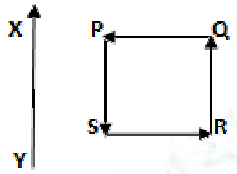
A) Electric Potential and Potential gradient are both scalar quantities

B) The potential gradient at a point is numerically equal to the electric field strength at that point

C) The electric potential at a point is the force on unit positive charge placed at that point

D) Electric field Strength at a point is the work done in bringing the positive unit charge from infinity to that point.

54) A long straight wire XY lies in the same plane as a square loop of wire PQRS which is free to move. The sides PS and QR are initially parallel to XY. The wire and the loop carry the steady current as shown in the figure given below.



Which will be the effect on the loop?

A) It will move towards the long wire

B) It will move away from the long wire

C) It will rotate about axis parallel to XY

D) It will be unaffected

55) A uniform vertical wire is stretched by hanging a mass from its lower end. Which of the following does not affect the strain in the wire?

A) Young's modulus of the metal

B) Cross sectional area of wire

C) Un-stretched length of wire

D) Load applied

56) Which of the following combinations of radioactive decay results in the formation of an isotope of original nuclide?

A) α *and* β

B) α and two β

C) α and four β

D) Two α and β

57) An air filled parallel plate capacitor has the capacitance of $5\ \mu F$. A slab of dielectric of relative permittivity 20 is introduced between them. The capacitance will be now:

A) $100\ \mu F$ B) $0.25\ \mu F$ C) $5\ \mu F$ D) None of these

58) A transformer has 50 turns on the primary side and 200 turns on the secondary side. If the rms values of primary voltage and current are 110V and 2A , respectively then the secondary current is about:

A) 8 A B) 2 A **C) 0.5 A** D) 4 A

59) The mass of an object at rest is m. According to special theory of relativity, when the speed of the object increases, the mass of the object:

A) Increases B) Decreases C) Approaches to zero D) Approaches to 2 m

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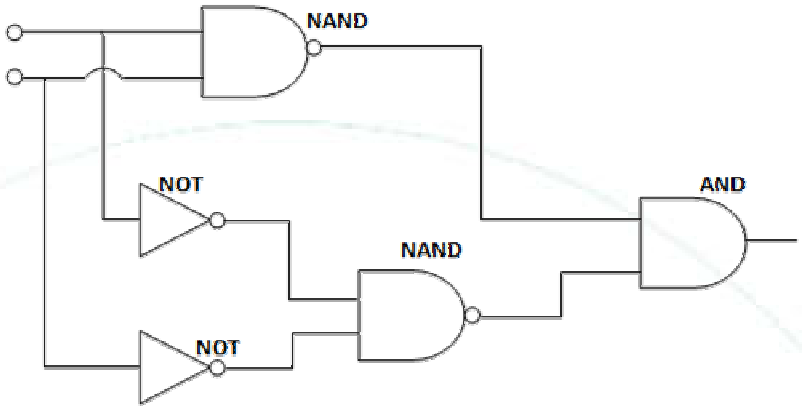
60) The diagram given below shows a logic network. Which single gate is equivalent to the network?



A) AND B) NAND C) NOR **D) XOR**

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CHEMISTRY

Note: *Following questions have been compiled through a group session right after ECAT-2018 therefore, the statements of the questions are written abruptly.*

61) HF is present at the room temperature in
A) Colorless gas
B) Vapor form
C) Liquid having viscosity less than water
D) Liquid having viscosity greater than water

62) The geometry of SO_2 is:
A) Linear
B) V shaped
C) Trigonal
D) Tetrahedral

63) Which of the following element has minimum ionization energy?
A) Cs
B) Na
C) Ra
D) Be

64) Which of the following elements has least number of electrons and it is also a non-metal?
A) Carbon
B) Silicon
C) Boron
D) Beryllium

65) Anisotropy is the property of solid associated with:
A) Cleavage
B) Isomorphism
C) Polymorphism
D) Habit of crystal

66) Glue is a(an):
A) Amorphous Solid
B) Amorphous Liquid
C) Crystalline Solid
D) Crystalline Liquid

67) Formation of plasma is possible:
A) by increasing Pressure
B) by decreasing Pressure
C) by increasing Temperature
D) by decreasing Temperature

68) Unpaired electron does not relate with:
A) Diamagnetism
B) Para magnetism
C) Electronic Conduction
D) All of these

69) The following reaction was allowed to reach the state of equilibrium:

$$CH_3COOH + CH_3OH \leftrightharpoons CH_3COCH_3 + H_2O$$

The unit of equilibrium constant K_c is:
A) No unit
B) $moldm^{-3}$
C) $mol^{-1}dm^{-3}$
D) $mol^{-2}dm^{6}$

70) How many resonance structure of benzene are known:
A) 4
B) 3
C) 5
D) 2

REMAINING TWENTY QUESTIONS FROM CHEMISTRY PORTION ARE NOT FOUND IN THE RECORD

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ENGLISH

Reading Comprehension

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