

REPRESENTATIVE QUESTIONS OF TEST PAPER
A BRIEF INTRODUCTION TO THE WRITTEN TEST.

The written test is an aptitude examination designed to test your general intelligence and basic understanding of Mathematics, Applied Sciences / Engineering and Analytical/logical thinking. This written test is like GRE Engineering. To help you in preparing for the written test, a brief outline of this test is presented below. Some of the questions may require numerical calculations, **so you must bring your own calculator.**

IT MAY BE NOTED THAT WRITING TABLES MAY NOT BE AVAILABLE DURING THE WRITTEN TEST. THEREFORE, ALL CANDIDATES ARE ADVISED TO BRING THEIR OWN WRITING CLIP BOARDS FOR THEIR CONVENIENCE DURING THE WRITTEN TEST.

The instructions sheet that will accompany the actual written test is attached. Read these instructions carefully now to save time during the examination. In order to give you an idea of the nature of the written test, some representative questions are also enclosed.

WRITTEN TEST OUTLINE.

The question paper is divided into two parts i.e. Part (A) and (B). There will be 50 questions in Part (A) and 50 Questions in Part (B). Part (A) is the general part to be attempted by all the candidates whereas Part (B) is the subject part having ten subject papers. Only the subject paper relevant to the candidate's academic background may be attempted by the candidate. The candidate should mention the subject paper he/she is attempting by filling the appropriate section of the answer sheet. The maximum time allowed is 4 hours.

1) General Part:

- a) It consists of two field namely Mathematics, Physics and English.**
- b) General Part must be attempted by all the candidates**
- c) General Part will have 50 questions in all. 20 from Mathematics, 20 from Physics and 10 from English**
 - i) Mathematics (Level F.Sc and B.Sc)

Basic Calculus	Differential Equations	Complex Variables	Boolean Algebra
Vector Algebra	Matrices	Statistics	

- ii) Physics (Level F.Sc and B.Sc)
- iii) English

2) Subject Part: It consists of eight papers from the following eight basic fields. Each of these eight papers will have 50 questions in all.

Physics	Electrical / Electronics Engineering
Chemistry	Mechanical Engineering
Mathematics	Chemical Engineering
Computer Science	Metallurgical / Materilas Engineering
Earth Sciences	Mining Engineering
	Civil Engineering

- a) Only one of these eleven subject papers relevant to the candidates background may be attempted by the candidate.
- b) The candidate should mention the subject paper he/she is attempting by filling the appropriate section of the answer sheet

IT IS IMPORTANT TO NOTE THAT IN ORDER TO QUALIFY THE WRITTEN TEST YOU HAVE TO QUALIFY IN EACH PART SEPARATELY. THEREFORE, YOU ARE STRONGLY ADVISED TO ATTEMPT QUESTIONS IN BOTH THE PARTS.

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TENTATIVE LIST OF RELATED TOPIC AND THEIR SHARE IN THE SUBJECT PART OF THE QUESTION PAPER

MATHEMATICS	
RELATED TOPICS	SHARE
Vector Analysis	All topics have equal share in the paper
Tensors Analysis	
Matrices and Determinants (types, equivalences, adjoint, inverse, determinants, linear equations)	
Complex Variables (numbers, complex differentiation, integration, Cauchy's theorem, Cauchy's integral formulas, residue theorem)	
Calculus (basic and advanced calculus)	
Differential Equations (linear, homogeneous, methods to solve first and second order ODEs, sets of linear ODEs, methods to solve PDEs)	
Numerical Analysis	
Linear Algebra	
PHYSICS	
RELATED TOPICS	SHARE
Mechanics	All topics have equal share in the paper
Waves	
Thermodynamics	
Electricity and Magnetism	
Light and optics	
Special theory of relativity	
Modern Physics	
COMPUTER SCIENCE	
RELATED TOPICS	SHARE
Programming	approx. 18%
Operating Systems	approx. 18%
Data Structures	approx. 18%
Computer Architecture	approx. 18%
Networking	approx. 18%
Others (databases, software engineering, discrete mathematics etc.)	approx. 10%
CHEMISTRY	
RELATED TOPICS	SHARE
Analytical Chemistry (Classical Quantitative Analysis, Instrumental Analysis)	approx. 15%
Inorganic Chemistry (Basic Descriptive Chemistry of Elements, Periodic and family trends, Electronic and Nuclear Structure, Transition Metal / Coordination Chemistry)	approx. 25%
Organic Chemistry (Conversion of functional groups, Reactive intermediated and reaction mechanisms, molecular structure)	approx. 30%
Physical Chemistry (General Chemistry, Classical and Statistical Thermodynamics, Quantum and Structural Chemistry, Kinetics)	approx. 30%
EARTH SCIENCE	
RELATED TOPICS	SHARE
Geology	approx. 20%
Seismology	approx. 20%
Oceanography	approx. 20%
Hydrology	approx. 20%
Atmosphere	approx. 20%

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MECHANICAL ENGINEERING	
RELATED TOPICS	SHARE
Mechanical Design and Analysis	approx. 30%
Kinematics, Dynamics and Vibration	approx. 15%
Materials and Manufacturing	approx. 15%
Thermodynamics and Energy Conversion Processes	approx. 20%
Heat Transfer, Fluid Mechanics and Hydraulic Machinery	approx. 20%
ELECTRICAL ENGINEERING	
RELATED TOPICS	SHARE
Basic Electrical Engineering , (Electric circuits, Electric and Magnetic Field Theory and applications, Digital Logic)	approx. 45%
Electronics, Electronic Circuits and Components	approx. 20%
Controls and Communications Systems	approx. 15%
Power	approx. 20%
CHEMICAL ENGINEERING	
RELATED TOPICS	SHARE
Mass/Energy Balances and Thermodynamics (Mass Balances, Energy Balances and Thermodynamics)	approx. 20%
Fluids (Fluid Transport, Mechanical-Energy Balance, Flow Measurement Techniques,	approx. 20%
Heat Transfer (Mechanisms, Applications,	approx. 20%
Mass Transfer (Phase Equilibria, Mass Transfer Contactors (Absorption, Stripping, Distillation, Extraction, Miscellaneous Separation Processes)	approx. 20%
Kinetics (Reaction Parameters, Reaction Rate, Reactor Design & Evaluation. Heterogeneous Reaction Systems)	approx. 10%
Process Control	approx. 10%
METALLURGICAL/MATERIALS ENGINEERING	
RELATED TOPICS	SHARE
Physical Metallurgy	All topics have almost equal share in the paper
Mechanical Metallurgy	
Thermodynamics & Phase Transformations	
Ferrous & Non-ferrous Alloys and Their Extraction	
Composites, Polymers and Ceramics	
X-ray Diffraction + Optical Metallography + Electron Microscopy + Non Destructive Testing	
Corrosion and Surface Engineering	
Material Processing	
Basic Engineering Principles	
MINING ENGINEERING	
RELATED TOPICS	SHARE
Exploration	approx. 10%
Mine Planning/Operations	approx. 45%
Mineral Processing	approx. 20%
Environmental and Reclamation	approx. 15%
CIVIL ENGINEERING	
RELATED TOPICS	SHARE
Environmental	approx. 20%
Geo-Technical	approx. 20%
Structural	approx. 20%
Transportation	approx. 20%
Water Resources	approx. 20%

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PAKISTAN INSTITUTE OF ENGINEERING AND APPLIED SCIENCES

ADMISSION TEST

TIME ALLOWED: Four (4) hours

ROLL NO:		SERIAL NO	
NAME:		EXAM CITY:	
	(Use BLOCK Letters)		
SIGNATURE:		SUBJECT OPTION FOR PART B:	

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING ANY QUESTION.

1. Make sure that your paper consists of ... sheets (1 title page typed on one side only, ...pages of questions typed on both sides and 4 empty sheet for rough work). Make sure that the question book given to you contains hundred (100) questions in all i.e. Fifty (50) questions in Part (A) and Fifty (50) questions in each of the subject papers in Part (B).
2. Make sure that you are provided with two answer sheets (A & B) consisting of two page only. Answer sheet A & B are for the General Part (PART A) and the Subject Part (PART B) respectively
3. **YOU MUST WRITE YOUR ROLL NO., NAME, EXAM CITY, SUBJECT OPTION FOR PART B ON THIS PAGE AND ON BOTH THE ANSWER SHEETS A & B AND. PUT YOUR SIGNATURE ON THIS PAGE AND ALSO ON THE ANSWER SHEETS ONLY IN THE SPACE PROVIDED.**
 - a. **You must enter your Roll No on the answer sheet in the same manner as explained in the example shown on your answer sheet.**
 - b. **You must enter your Subject Option for Part B on the answer sheet in the same manner as explained in the example shown on your answer sheet.**
 - c. **You must not bend, roll or fold the answer sheet.**
4. After the test is over, put your answer sheet inside the question book and return it to the examiner.
5. On your answer sheet for each question there are FOUR choices (i.e. A,B,C,D). Fill the appropriate choice only with the 2B pencil provided to you. **Do not use any thing other than the 2B pencil to fill the appropriate choice.** If you wish to change your answer, you may do so by erasing the previous answer. You must not either overwrite or fill multiple choices.
6. Each correct answer will carry **THREE** marks. **ONE** mark will be deducted for each incorrect answer.
7. The question paper is divided into two parts i.e. Part (A) and (B). In order to qualify the written test you have to qualify both the parts. Therefore, you are strongly advised to attempt as many questions as you can in both the parts.
8. **You can carry out your rough work anywhere in the question book as well as on the empty sheet provided. DO NOT USE THE ANSWER SHEET FOR ROUGH WORK.**
9. Put your pencils down as soon as you hear "**STOP WRITING**", otherwise your paper may be canceled.
10. **Any one found using unfair means will be disqualified.**

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PART (A) (GENERAL PART)

Mathematics

- Q.1. $y = \ln x / 4$ is solution of the differential equation
 (A) $\frac{dy}{dx} = e^{4x}$ (B) $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 4$ (C) $4\frac{dy}{dx} = \frac{1}{x}$ (D) none of A,B,C.
- Q.2. The differential equation representing the family of curves $xy = c$ is:
 (A) $\frac{dy}{dx} = 1$ (B) $\frac{dy}{dx} = \frac{-1}{x}$ (C) $\frac{dy}{dx} = \frac{-y}{x}$ (D) $\frac{dy}{dx} = \frac{-x}{y}$
- Q.3. Which of the following is correct?

(A) $\overline{a \times b + c} = \overline{a \times c} + \overline{b + c}$	(B) $\overline{a \times b + c} = \overline{a \times b} \overline{c} + \overline{a \times c} \overline{b}$
(C) $\overline{a \times b + c} = \overline{a \times b} + \overline{a \times c}$	(D) $\overline{a \times b + c} = \overline{a + b} \times \overline{c}$.

And so on

Physics

- Q.1. The average distance from the sun to the earth is approximately 93 million miles. The approximate speed (km per second) of the earth in its orbit around the sun is closest to :
 (A) 5 (B) 10 (C) 20 (D) 30
- Q.3. A wheel is revolving at a steady rate of 120 rev/min., its angular velocity in radians per second is then closest to :
 (A) 2π (B) 4π (C) 6π (D) 8π
- Q.5. Power consumed by two 100 W bulbs in series supplied with 220 volts ac will be:
 (A) 200 W (B) 100 W (C) 50 W (D) 25 W

And so on

English

Questions: 1 – 3

The Richter scale is a numerical logarithmic scale developed and introduced by Charles R. Richter in 1935 to measure the amplitude of the largest trace recorded by a standard seismograph one hundred kilometers from the epicenter of an earthquake. Tables have been formulated to demonstrate the magnitude of any earthquake from any seismograph. For example, for a one-unit increase in magnitude, there is an increase of times thirty in released energy. The Richter scale considers earthquake of 6.75 as great and 7.0 to 7.75 as major. An earthquake that reads 4 to 5.5 would be expected to cause localized damage, and those of magnitude 2 may be felt. It is estimated that almost one million earthquakes occur each year, but most of them are so minor that they pass unnoticed.

- Q.1 What does this passage mainly discuss?
 (A) Charles F. Richter (C) Earthquakes
 (B) Seismography (D) The Richter scale
- Q.2 According to the information in the passage, what does Richter scale record?
 (A) History (B) Biography (C) Geology (D) Mathematics
- Q.3 According to the Richter scale, which of the following numbers would indicate that there had probably been damage to the immediate area only?
 (A) The distance from the epicenter (C) The degree of damage
 (B) The amplitude of the largest trace (D) The location of the epicenter

And so on

PART (B) (SUBJECT PART)

Physics

- Q.1 Which of the following has an upper limit of $\lambda = 18760 \text{ \AA}$ for hydrogen spectral series?

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- (A) Balmer series (B) Lyman series (C) Brackett series (D) Paschen series
- Q.2 If $h = 6.63 \times 10^{-34} \text{ J-s}$, $e = 1.6 \times 10^{-19} \text{ C}$, then uncertainty in the energy of a photon which is emitted from an atom in approximately 0.01 microsecond is
(A) $6.4 \times 10^{-19} \text{ ergs}$ (B) All of the (C) $4 \times 10^{-7} \text{ eV}$ (D) $6.4 \times 10^{-26} \text{ J}$
- Q.3 Which of the following could not be explained on wave nature of radiation?
(A) interference of light (c) polarization of
(B) diffraction of light (D) photoelectric emission

And so on

Chemistry

- Q.1. Which of the following statements is correct about chemical equilibrium ?
(A) At equilibrium no more reactants are transformed into products
(B) At equilibrium the rate constant for the forward and reverse reaction are equal
(c) At equilibrium there are equal amounts of reactants and products
(D) At equilibrium the forward and reverse rates are equal
- Q.2 How many atoms of oxygen are present in 5.6 liters of SO_2 ?
(A) $\frac{1}{4} \cdot 6.02 \times 10^{23}$ (B) $\frac{1}{2} \cdot 6.02 \times 10^{23}$ (C) $1.0 \cdot 6.02 \times 10^{23}$ (D) $2.0 \cdot 6.02 \times 10^{23}$
- Q.3 Molecules of an ideal gas exert a force on the container walls due to
(A) Surface tension of the gas
(B) Cohesion between molecules of gas & its container wall
(C) Gravitational repulsion at the wall
(D) Collision between molecules of the gas & its container wall

And so on

Mathematics

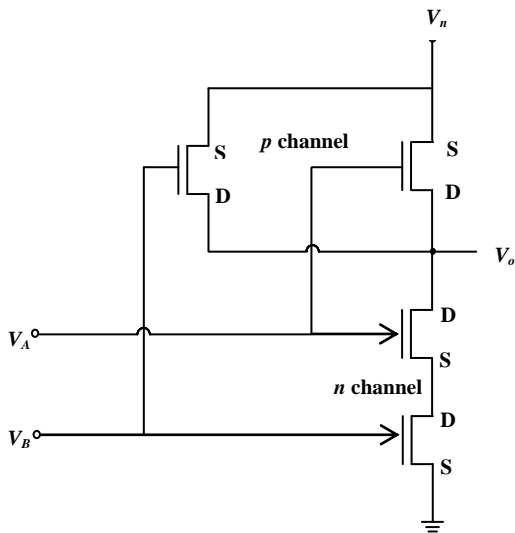
- Q.1 The concavity of the curve described by
$$y = x^3 - 1.5x^2 - 6x + 3$$
Changes at:
(A) (-0.5, -0.25) (B) (0.5, -0.25) © (0.5, 0.25) (D) None of the others
- Q.2 The volume of the solid generated by rotating $y = x^2$ with $0 \leq x \leq 2$ about the x-axis is
(A) $32/7\pi$ (C) $32/3\pi$
(B) None of the others (D) $32/5\pi$
- Q.3 The reaction rate $R(x)$ of a chemical reaction described as a function of the concentrations-product x :
$$R(x) = 2(2-x)(5-x) \quad 0 \leq x \leq 2$$
is maximal when
(A) $x = 1$ (B) $x = 0$ (C) None of the (D) $x = 2$

And so on

Computer Science

- Q.1 The term 'word' in computer terminology refers to:
(A) Bits formed into groups (B) Coded instructions (C) Stored instructions
(D) Programming language used
- Q.2 A network of geographically distant computers and terminals is called a
(A) Bus (B) WAN (C) LAN (D) Hub
- Q.3 The CMOS circuit shown in the following figure, is an implementation of

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- (A) NOR gate (B) NAND gate © AND gate (D) None of the

And so on

Earth Science

- Q.1 For the sake of comparison, which of the following objects is rated as having a hardness of 5-5½ according to Moh's hardness scale?
 (A) copper coin (B) brass pin (C) window glass (D) steel knife
- Q.2 Plagioclase minerals are basically
 (A) calcium-sodium feldspars (B) non-aluminous pyroxenes
 (C) potassium feldspars (D) None of the given
- Q.3 Which of the following forms of sand dunes have a crescent like shape with its horns pointing in the direction of wind?
 (A) fore dunes (B) barchan dunes (C) parabolic dunes (D) transverse dunes

And so on

Mechanical Engineering

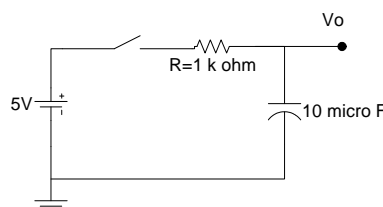
- Q.1 An inclined plane is often used to assist in lifting heavy objects. This is done since the:
 (A) Force is reduced (B) Work is reduced (C) Potential energy is increased
 (D) Weight is increased
- Q.2 For a mass suspended by a spring, at maximum displacement (k = spring constant, a is displacement amplitude)
 (A) Kinetic energy is zero, potential energy is $kA^2/2$
 (B) Potential energy is zero, kinetic energy is $kA^2/2$
 (C) Both kinetic & potential energy contribute equally to give a total energy of $kA^2/2$ (D) Potential energy is less than kinetic energy
- Q.3 For a gas that is allowed to expand reversibly and adiabatically there is no change in
 (A) Internal energy (B) Temperature (C) Entropy (D) Both a and b

And so on

Electrical/Electronics Engineering

- Q.1 If the capacitor C is initially charged to 2 V in the following figure the value of output voltage after 2ms of closing of switch is:

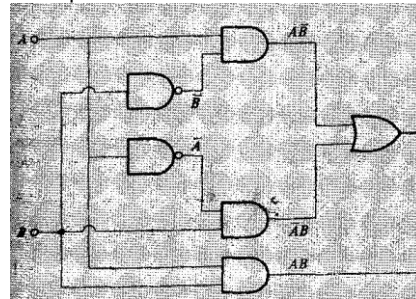
- (A) 3 V
 (B) 2.5 V
 (C) 1.5 V
 (D) 4.5 V



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Q.2 The digital logic circuit shown in the following figure is an implementation of

- (A) Two input multiplier
- (B) A false circuit
- (C) Two input Subtractor
- (D) Two input adder



- Q.3 The effect of the negative feedback on an amplifier is to
- (A) increase gain
 - (B) make the amplifier oscillate
 - (C) improved stability
 - (D) both (A) and (C)

And so on

Mining Engineering

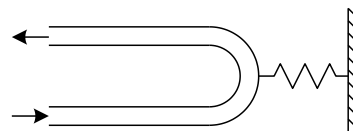
- Q.1 Which of the following materials is used as a source of "lime" for production of cement?
 (A) Clay (B) Gypsum (C) Marl (D) None of the given
- Q.2 If a drying-grinding plant consumes energy at a rate of 2250 BTU/lb of water on drying only, calculate the hourly energy requirement for drying, if the plant processes 40 tons of feed per day comprising three 8-hour shifts. The moisture content of the feed is 5% (by weight). (Given that 1 ton = 2240 lbs)
 (A) 1.26×10^6 BTU/hr (B) 4.20×10^5 BTU/hr (C) 1.26×10^5 BTU/hr (D) 4.20×10^6 BTU/hr
- Q.3 Which of the following is considered as a continuous material handling (muck, load, haul, dump) equipment?
 (A) Scraper (B) Dragline (C) Bulldozer (D) Auger

And so on

Chemical Engineering

- Q.1. A 10 cm diameter spherical steel ball at 80°C is suddenly quenched in a large bucket of water at 20°C. If the average heat transfer coefficient is 10 W/m²-s, the initial cooling rate of ball is closest to:
 (A) 18.8 W (B) 6.3 W (C) 4.7 W (D) Can not be calculated from this data
- Q.2. A gas phase reaction takes place on the surface of a cylindrical catalyst particle. If the process is controlled by the diffusion of reactants on the catalyst surface than by doubling the catalyst surface area the rate of reaction will be:
 (A) Doubled (B) Increased 4 times (C) Reduced by Half (D) Unchanged
- Q.3. Water flows in a 3 cm ID U-bend pipe with a flow rate of 0.5 kg/s as shown below. The force in the spring will be:

(A) 4.9 N (Compressive)
(B) 4.9 N (Extensive)
(C) 0.707 N (Compressive)
(D) 0.707 N (Extensive)



And so on

Metallurgical / Materials Engineering

- Q.1. The empirical rule to predict the existence of solid solubility is called
 (A) Lever Rule (B) Hund's Rule (C) Henry's Rule (D) Hume-Rothery's Rule
- Q.2. In F.C.C lattice the packing sequence of atoms is
 (A) AB AB AB ___ (B) BC BC BC ___ (C) AC AC AC ___ (D) ABC ABC ___
- Q.3. In screw dislocation, the dislocation line is
 (A) parallel to burger's vector (B) perpendicular to burger's vector
 (C) at an angle of 30° to the burger's vector (D) None of A, B, C.

