

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 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 3 hours.

1) General Part:

- a) *It consists of three 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 & Physics reespectively 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 papers from the following basic fields. Each of these papers will have 50 questions in all.*

| | |
|-----------|--|
| Physics | Electrical / Electronics / Telecommunication |
| Chemistry | Mechanical |
| Chemical | Metallurgy / Material |
| Computer | Mechatronics |
| Civil | |

- a) Only one of these 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

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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.

Details Of Topics And Their Share In The Subject Part Of The Question Paper

| PHYSICS | |
|---|--|
| RELATED TOPICS | SHARE |
| Mechanics , Waves, Thermodynamics | All topics have equal share in the paper |
| Electricity and Magnetism, Light and optics and Modern Physics | |
| CHEMISTRY | |
| RELATED TOPICS | SHARE |
| Analytical Chemistry (Classical Quantitative Analysis, Instrumental Analysis) | approx. 15% |
| Inorganic Chemistry (Basic Chemistry of Elements, Periodic & family trends, Electronic & 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% |
| MECHANICAL | |
| RELATED TOPICS | SHARE |
| Mechanical Design and Anlysis | approx. 30% |
| Kinematics, Dynamics and Vibration | approx. 15% |
| Materials and Manufacturing | approx. 15% |
| Thermodynamics and Energy Convesion Processes | approx. 20% |
| Heat Transfer, Fluid Mechanics and Hydraulic Machinery | approx. 20% |
| ELECTRICAL / ELECTRONICS / TELECOMMUNICATION | |
| 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 | |
| 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% |

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| | |
|---|---|
| Kinetics (Reaction Parameters, Reaction Rate, Reactor Design & Evaluation. Heterogeneous Reaction Systems) | approx. 10% |
| Process Control | approx. 10% |
| METALLURGY/MATERIAL | |
| RELATED TOPICS | SHARE |
| Physical Metallurgy, Mechanical Metallurgy | All topics have almost equal share in the paper |
| 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 | |
| COMPUTER | |
| 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% |
| CIVIL | |
| RELATED TOPICS | SHARE |
| Environmental | approx. 20% |
| Geo-Technical | approx. 20% |
| Structural | approx. 20% |
| Transportation | approx. 20% |
| Water Resources | approx. 20% |
| MECHATRONICS | |
| RELATED TOPICS | SHARE |
| Basic Mechanical Engineering | 10% |
| Electrical & Electronic Engineering | 30% |
| Systems Design Engineering | 10% |
| Control Engineering | 30% |
| Computer Engineering & Science | 10% |
| Robotics and Factory Automation | 10% |

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PAKISTAN INSTITUTE OF ENGINEERING AND APPLIED SCIENCES

ADMISSION TEST

TIME ALLOWED: Three (3) 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 an answer sheet for the General Part (PART A) and the Subject Part (PART B).
3. ***YOU MUST WRITE YOUR ROLL NO., NAME, EXAM CITY, SUBJECT OPTION FOR PART B ON THIS PAGE AND ON THE ANSWER SHEET. PUT YOUR SIGNATURE ON THIS PAGE AND ALSO ON THE ANSWER SHEET 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) $\overline{a} \times (\overline{b} + \overline{c}) = (\overline{a} \times \overline{c}) + (\overline{b} + \overline{c})$ (B) $\overline{a} \times (\overline{b} + \overline{c}) = (\overline{a} \times \overline{b})\overline{c} + (\overline{a} \times \overline{c})\overline{b}$
(C) $\overline{a} \times (\overline{b} + \overline{c}) = (\overline{a} \times \overline{b}) + (\overline{a} \times \overline{c})$ (D) $\overline{a} \times (\overline{b} + \overline{c}) = (\overline{a} + \overline{b}) \times \overline{c}$.

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.2. 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.3. 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 (B) Seismography (C) Earthquakes (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

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PART (B) (SUBJECT PART)

Physics

- Q.1 Which of the following has an upper limit of $\lambda = 18760 \text{ \AA}$ for hydrogen spectral series?
(A) Balmer series (B) Lyman series (C) Brackett series (D) Paschen series
- Q.2 If $h = 6.63 \times 10^{-34} \text{ J}\cdot\text{s}$, $e = 1.6 \times 10^{-19} \text{ C}$, 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 others (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 electromagnetic
(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

Mechanical

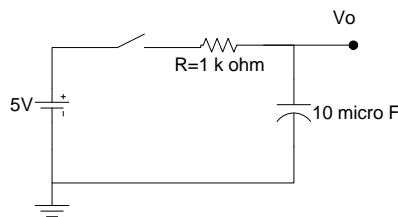
- Q.1 An inclined plane is often used to assist in lifting heavy objects. This is done since the:
(A) Force is reduced (B) Work is reduced
(C) Potential energy is increased (D) Weight is increased
- Q.2 For a mass suspended by a spring, at maximum displacement ($k = \text{spring constant}$, a is displacement 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/Telecommunication

- 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

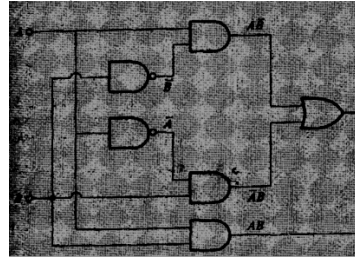


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Q.2 The digital logic circuit shown in the following figure is an implementation of

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

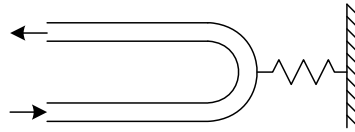


Q.3 The effect of the negative feedback on an amplifier is to
 (A) increase gain (B) make the amplifier oscillate
 (C) improved stability (D) both (A) and (C)

And so on

Chemical

- 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

Metallurgy / Material

- 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.

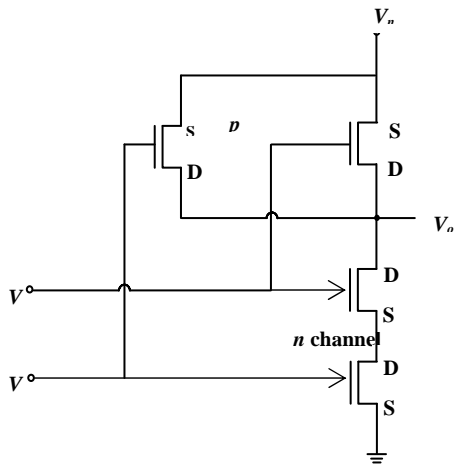
And so on

Computer

- 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

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Q.3 The CMOS circuit shown in the following figure, is an implementation of



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

And so on

Civil

- Q.1. In the Mohr's stress circle, the centre has coordinates
 (A) (0, 0) (B) (σ_x , σ_y) (C) $[0, 0.5 (\sigma_x + \sigma_y)]$ (D) $[0.5 (\sigma_x + \sigma_y), 0]$
- Q.2. The statement that a fluid's velocity of flow through a porous medium is directly related to the hydraulic gradient, is known as
 (A) Hook's Law (B) Stoke's Law (C) Newton's Law (D) Darcey's Law
- Q.3. How much axial load can a compression block (cross-section = 100 by 100 mm) carry if its rupture stresses in compression and shear are 20 and 9 MPa respectively?
 (A) 200 kN (B) 90 kN (C) 180 kN (D) 400 kN

And so on

Mechatronics

- Q1. Polling is a method used for
 (A) determining the state of the microprocessor
 (B) establishing communication between the CPU and peripheral
 (C) establishing a priority for communication with several peripherals
 (D) determining the next instruction
- Q2. Selective Compliant Assembly Robot Arm (SCARA), robots are being increasingly used for
 (A) loading / unloading conveyor systems
 (B) large area cover
 (C) providing intricate movements
 (D) assembly operations particularly in the field of electronics
- Q3. The Nyquist plot of loop transfer function $G(s) H(s)$ of a closed loop control system passes through the point $(-1, j0)$ in the $G(s) H(s)$ plane. The phase margin of the system is
 (A) 0° (B) 45° (C) 90° (D) 180°

And so on