Salim Habib University

PhD SAMPLE TEST (Biomedical Engineering)

Instructions:

There are three sections of the paper: English (25 marks), Quantitative/Analytical, Logical and Reasoning (25 marks), and Subjective (50 marks).

- From the English section, attempt 25 questions (each question carries 1 mark).
- From the Quantitative/Analytical, Logical and Reasoning section, attempt 25 questions (each question carries 1 mark).
- From the Subjective section:
    - 30 MCQs (each question carries 1 mark).
    - 2 descriptive questions (each question carries 10 marks).

SECTION-1. ENGLISH

Q1. Select the synonym for **"Pernicious"**:
a) Harmless
b) Deleterious
c) Innocuous
d) Benign

Correct Answer: B

Q2. Choose the pair that best complete the analogy;

OBSTINATE : YIELD ::
a) Frugal : Conserve
b) Garrulous : Talk
c) Capricious : Predict
d) Erudite : Learn

Correct Answer: C

Q3. Idiom *"Throw down the gauntlet"* means:
a) To admit defeat politely
b) To issue a challenge boldly
c) To withdraw from competition
d) To avoid direct confrontation

Correct Answer: B

Q4. Sentence Completion:

Despite his reputation for ___, the researcher was remarkably open to new perspectives and alternative methodologies.
a) Flexibility
b) Dogmatism

c) Curiosity
d) Humility

Correct Answer: B

Passage (short & crisp)

Organizations that centralize decision-making often gain strategic coherence and economies of scale, but they can be slow to respond to local contingencies. Decentralized units respond faster and tailor actions to context, yet their autonomy can produce conflicting priorities and duplication of effort. The optimal design, the author argues, is not pure centralization or pure decentralization but institutional mechanisms that preserve coordinated strategy while enabling timely local adaptation.

Q1. Which one of the following is **best supported** by the passage?
a) Centralized organizations always outperform decentralized ones in implementing strategy.
b) Decentralized units never achieve economies of scale.
c) An organization that lacks mechanisms for coordination risks incoherence across units.
d) Local adaptation is unnecessary when strategy is clear.

Correct Answer: C

Q2. The author's conclusion that mechanisms should preserve coordination while enabling adaptation depends most on which assumption?
a) Local managers prefer autonomy over consultation.
b) Strategic coherence and timely local response are both valuable organizational goals.
c) Central offices always have better information than local units.
d) All organizations face identical local contingencies.

Correct Answer: B

Q3. Which of the following, if true, would most strengthen the author's conclusion?
a) Case studies showing some centralized firms achieved coherence but lost market share due to slow local responses.
b) Evidence that local units in all industries always make better decisions than central offices.
c) Data showing that decentralization eliminates all duplication of effort.
d) A theory asserting that strategy is irrelevant to organizational performance.

Correct Answer: A

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SECTION 2
ANALYTICAL, LOGICAL, and QUANTITATIVE REASONING

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Q1. If a number is increased by 25% and then decreased by 25%, the final value becomes 225. What was the original number?
a) 280
b) 300
c) 320
d) 240

Correct Answer: D

Q2. The ratio of two numbers is 5:7. If the smaller number is increased by 25%, the ratio becomes 25:36. What is the larger number?
a) 84
b) 90
c) 96
d) 108

Correct Answer: A

Q3. A train **190 m long** passes a pole in **15 seconds**. What is its speed in km/h?
a) 40 km/h
b) 45.6 km/h
c) 48 km/h
d) 52 km/h

Correct Answer: B

Q4. Four colleagues A, B, C, D sit in a row. A is left of B. C sits at one of the ends. D sits between A and C. Which is true?
a) A is at leftmost end.
b) B is rightmost.
c) D is between B and C.
d) C is rightmost.

Correct Answer: B

Q5. Statement: "The university will increase research grants next year." Which assumption is required for this statement to affect faculty behavior immediately?
a) Faculty are aware of the announcement.
b) Grants are distributed equally.
c) Students will benefit from grants.
d) Faculty salaries will rise.
Correct Answer: A

Q6. Premise: "Company sales fell by 10% in Q1." Which is the best inference?
a) Company will cut staff.
b) Demand for product decreased in Q1.
c) Company's market share decreased.
d) Sales revenue in Q1 is 90% of last year's Q1.
Correct Answer: D

SECTION-3. SUBJECT QUESTIONS

1. Viscosity of blood depends on
   I. amount of plasma protein   II. number of cells in blood   III.   temperature

   (a) II and III
   (b) I and III
   (c) I and II
   (d) I, II and III

Correct Answer: d

2. The recording of the bio-potentials generated by the movement of eye ball is called

(a) Apexcardiography
(b) Electrooculography
(c) Electroretinography
(d) Ballistocardiography

Correct Answer: b

3. "An aeroplane's wing is specially shaped so that it gets some of its lift due to Bernoulli's principle".

Which of the following options shows the correct explanation of the above statement?

(a) The air travels more underneath the wing than above it. This creates higher pressure above the wing than below and lift is created.
(b) The air travels more over the top of the wing than beneath it. This creates higher pressure below the wing than above it and lift are created.
(c) The air travels more over the top of the wing than beneath it. This creates lower pressure below the wing than above it and lift are created.
(d) The air travels more underneath the wing than above it. This creates lower pressure above the wing than below it and lift are created.

Correct Answer: a

4. For the rational functions $f(x)$ and $g(x)$, one of the conditions required for L' Hospital's Rule to work would be

(a) $g(x) = 0$ only
(b) $f(x) = 0$ only
(c) $f(x) = 0, g(x) = 0$
(d) $f(x) = 0, g(x) \neq 0$

Correct Answer: c

5. What is the necessary condition for a discrete-time LTI system, x(n), to be causal in nature?

(a) Impulse response should be non-zero, if n < 0
(b) Impulse response should be zero, if n > 0
(c) Impulse response should be zero, if n < 0
(d) Impulse response should be non-zero, if n > 0

Correct Answer: c

6. In computer programming, which of the following best describes the concept of abstraction?

(a) The practice of using recursion in algorithms.
(b) The use of binary code to represent characters in a computer.
(c) A programming language that closely resembles human language
(d) The process of hiding complex implementation details and showing only necessary functionalities.

Correct Answer: d

7. For a sequence of finite duration with anti-causal property, the Z-transform ROC is

(a) entire z-plane, except at $z = \infty$

(b) entire z-plane, except at z = 0
(c) z-plane at z = ∞
(d) z-plane at z = 0

Correct Answer: a

PART–2– DESCRIPTIVE QUESTIONS.

1. In a patient monitoring device, a silicon diode is used for rectification in the power supply circuit.
   (a) If the input AC signal has a peak voltage of 10 V, calculate the output DC voltage across the load for half-wave rectification (consider diode forward voltage drop = 0.7 V).
   (b) Explain how the rectification process is important for the safe operation of biomedical instruments.

2. An ECG machine records signals with unwanted 50 Hz power line interference.
   (a) Explain why this interference occurs.
   (b) Suggest a suitable filter design (Low-pass, High-pass, or Notch filter) with reasoning.
   (c) Discuss how improper filtering can affect diagnosis in cardiology.

3. Compare the working principles, advantages, and limitations of a Thermistor-based temperature sensor and an Infrared-based temperature sensor used in clinical thermometers. Which one is more suitable for non-contact patient monitoring, and why?

Good luck and the End.