

Digital circuit objective type questions answers Full Version

Digital Circuit Objective Type Questions Answers: A Comprehensive Guide

Digital circuit objective type questions answers are an essential resource for students, engineers, and professionals preparing for exams, certifications, or practical applications in the field of digital electronics. These questions help in assessing conceptual understanding, problem-solving skills, and the ability to apply theoretical knowledge to real-world scenarios. Whether you are a beginner or an experienced professional, mastering objective questions related to digital circuits can significantly boost your confidence and performance in examinations or technical interviews.

In this comprehensive guide, we will explore various aspects of digital circuit objective questions and answers, covering fundamental concepts, types of questions, common topics, and tips for effective preparation.

Understanding Digital Circuits and Their Importance

Digital circuits form the backbone of modern electronic systems, including computers, smartphones, digital cameras, and many other digital devices. Unlike analog circuits, digital circuits operate using discrete signals representing binary values (0s and 1s). This binary nature simplifies the design and enhances reliability, making digital circuits more suitable for complex and high-speed operations.

Key reasons why digital circuits are vital include:

- Ease of design and troubleshooting
- Compatibility with digital systems
- High noise immunity
- Scalability and integration capability

Types of Objective Questions in Digital Electronics

Objective questions in digital electronics generally fall into the following categories:

Multiple Choice Questions (MCQs)

- Present a question with four or more options.
- Candidate selects the most appropriate answer.

True or False Questions

- Ask whether a statement about digital circuits is correct or incorrect.

Matching Type Questions

- Match items from two columns, such as logic gates with their symbols or functions.

Fill in the Blanks

- Complete sentences or statements with missing keywords or phrases.

Each question type tests different skills, from conceptual understanding to quick recall and application.

Common Topics Covered in Digital Circuit Objective Questions

To excel in digital circuit objective questions, it is crucial to be familiar with key topics. These include:

Logic Gates and Their Functions

- AND, OR, NOT, NAND, NOR, XOR, XNOR gates
- Symbol representations
- Truth tables

Boolean Algebra

- Simplification of Boolean expressions
- Laws and theorems like De Morgan's Theorems

Combinational Logic Circuits

- Adders, subtractors
- Multiplexers, demultiplexers
- Encoders, decoders

Sequential Circuits

- Flip-flops (SR, JK, D, T)
- Counters (synchronous and asynchronous)
- Shift registers

Number Systems and Codes

- Binary, octal, decimal, hexadecimal
- Gray code, BCD, Excess-3 code

Memory and Storage Devices

- RAM, ROM, PROM
- Latches and registers

Timing and Clocking

- Clock signals
- Setup and hold times

Sample Objective Questions and Answers

Below are some practical examples of digital circuit objective questions with their answers to help you understand the question patterns and concepts:

Question 1:

Which logic gate is known as a universal gate?

A) AND

B) OR

C) NAND

D) XOR

Answer: C) NAND

Explanation: NAND gates are called universal gates because any other logic gate can be implemented using only NAND gates.

Question 2:

What is the output of the following Boolean expression? $A' B + A B'$

A) XOR of A and B

B) AND of A and B

C) OR of A and B

D) NOR of A and B

Answer: A) XOR of A and B

Explanation: The expression represents the XOR operation.

Question 3:

In a D flip-flop, the data is transferred to the output on which edge of the clock?

A) Rising edge

B) Falling edge

C) Both edges

D) Neither edge

Answer: A) Rising edge

Explanation: Standard D flip-flops are positive-edge triggered, transferring data on the rising edge of the clock.

Question 4:

Which of the following is used to convert a parallel data input into serial output?

- A) Shift register
- B) Counter
- C) Decoder
- D) Multiplexer

Answer: A) Shift register

Explanation: Shift registers are used for serial-in, serial-out or parallel-in, serial-out data transfer.

Tips for Preparing Digital Circuit Objective Questions

Effective preparation can significantly improve your performance. Here are some tips:

- Understand Fundamental Concepts

Focus on mastering logic gates, Boolean algebra, and basic digital logic design principles.

- Practice Previous Year Questions

Solve past papers and sample questions to familiarize yourself with question patterns.

- Use Flashcards for Quick Revision

Create flashcards for truth tables, logic gate symbols, and key formulas.

- Learn Simplification Techniques

Practice Boolean algebra simplification to handle questions efficiently.

- Take Mock Tests

Simulate exam conditions to improve time management and accuracy.

- Join Study Groups

Discussing questions with peers can help clarify doubts and reinforce concepts.

- Focus on Weak Areas

Identify topics where you struggle and allocate extra time for revision.

Resources for Digital Circuit Objective Questions and Answers

There are numerous online resources where you can find practice questions, tutorials, and explanations:

- Books:
 - "Digital Logic and Computer Design" by M. Morris Mano
 - "Digital Electronics" by William Kleitz
- Online Platforms:
 - GeeksforGeeks
 - TutorialsPoint
 - Coursera courses on digital electronics
- Mobile Apps:
 - Digital Logic Quiz Apps
 - Exam preparation apps for electronics engineering

Conclusion

Mastering digital circuit objective type questions answers is a pivotal step toward excelling in digital electronics examinations and practical applications. By understanding the core concepts, practicing diverse question types, and following strategic preparation tips, you can enhance your problem-solving skills and confidence. Remember to stay consistent in your studies, review

regularly, and use available resources effectively. With dedication and systematic effort, success in digital electronics is well within your reach.

Start practicing today and unlock your potential in digital circuit design and analysis!

Digital Circuit Objective Type Questions Answers: A Comprehensive Guide for Students and Professionals

In the realm of digital electronics, mastering digital circuit objective type questions answers is essential for students preparing for exams, engineers designing circuits, and educators developing assessment tools. These questions are a staple in technical assessments, helping evaluate understanding of fundamental concepts, logic gates, flip-flops, counters, and more. This guide offers an in-depth analysis of how to approach, solve, and utilize objective questions effectively, ensuring you are well-equipped to excel in this area.

Understanding the Significance of Objective Type Questions in Digital Circuits

Objective questions serve as a quick and efficient way to assess knowledge across a broad spectrum of topics within digital electronics. They are designed to test:

- Conceptual understanding of logic gates, Boolean algebra, and digital components.
- Application skills in designing combinational and sequential circuits.
- Analytical ability in troubleshooting and circuit analysis.
- Memory recall of standard facts, formulas, and truth tables.

Proper preparation and familiarity with these question types streamline exam performance and reinforce core concepts.

Common Topics Covered in Digital Circuit Objective Questions

To excel in objective questions, it's crucial to identify the core topics frequently tested:

- Logic Gates and Boolean Algebra
 - AND, OR, NOT, NAND, NOR, XOR, XNOR
 - Simplification of Boolean expressions
 - Logic gate truth tables

- Digital Logic Design

- Combinational circuits (adders, multiplexers, encoders)
- Sequential circuits (flip-flops, counters, registers)

- Number Systems and Codes

- Binary, decimal, octal, hexadecimal
- Gray code, BCD, ASCII

- Digital Circuit Analysis

- Karnaugh maps
- Logic minimization
- Timing diagrams

- Digital ICs and Devices

- IC number classifications
- Characteristics and applications

Strategies for Approaching Objective Type Questions

Before delving into answering questions, adopt strategic approaches:

- Read the Question Carefully

- Pay attention to keywords like "which," "all," "except," "most," or "least."
- Identify what is being asked: truth table, logic expression, circuit behavior.

- Recall Fundamental Concepts

- Visualize or write down truth tables or Boolean expressions if needed.
- Use diagrams to aid understanding when necessary.
- Eliminate Incorrect Options
- Cross out options that are clearly wrong.
- Narrow choices down to the most plausible answers.
- Check for Traps
- Be wary of options that seem correct but don't satisfy all conditions.
- Revisit the question to ensure your answer aligns with its specific requirements.
- Use Logical Reasoning
- Think through the logic behind each option.
- For circuit-related questions, mentally simulate the circuit operation.

Common Types of Objective Questions and How to Tackle Them

Multiple Choice Questions (MCQs)

- Usually present four options.
- Focus on understanding the question's core to select the best answer.

True/False

- Test the validity of a statement.
- Confirm whether the statement aligns with fundamental principles.

Fill in the Blanks

- Requires precise recall of facts like gate symbols, truth values, or circuit parameters.

Match the Following

- Connect concepts, components, or functions with their descriptions or applications.

Sample Questions with Detailed Explanations

Question 1: Which of the following gates outputs true only when both inputs are true?

- a) AND
- b) OR
- c) NAND
- d) NOR

Answer: a) AND

Explanation: The AND gate outputs true (1) only when all its inputs are true. The other gates have different behaviors: OR outputs true if at least one input is true, NAND outputs false only when both inputs are true, and NOR outputs true only when all inputs are false.

Question 2: In a 4-bit binary counter, what is the maximum count value?

- a) 15
- b) 16
- c) 255
- d) 1023

Answer: a) 15

Explanation: A 4-bit binary counter counts from 0 (0000) to 15 (1111). The maximum count is $2^4 - 1 = 15$.

Question 3: Which Boolean algebra law states that $A + A' = 1$?

- a) Identity Law
- b) Complement Law
- c) Null Law
- d) Distributive Law

Answer: b) Complement Law

Explanation: The Complement Law indicates that a variable ORed with its complement is always 1.

Tips for Effective Preparation and Practice

- Build a Strong Conceptual Foundation: Focus on understanding Boolean algebra, logic gates, and circuit operation principles.
- Practice with Past Papers: Solve previous years' objective questions to familiarize yourself with question patterns.
- Create Flashcards: For quick revision of logic gate symbols, truth tables, and Boolean laws.
- Use Mock Tests: Simulate exam conditions to improve speed and accuracy.
- Review Mistakes: Analyze errors to prevent repeat mistakes in actual tests.

Resources and Tools for Mastery

- Digital Circuit Textbooks: For theory and practice problems.
- Online Quizzes and Apps: Interactive platforms for self-assessment.
- Simulation Software: Tools like Logisim or Multisim for circuit visualization and testing.
- Study Groups: Collaborate with peers for discussion and clarification.

Conclusion

Mastering digital circuit objective type questions answers requires a systematic approach, solid conceptual understanding, and regular practice. By focusing on core topics, employing strategic thinking, and utilizing available resources, aspirants can confidently navigate objective questions and achieve high scores. Remember, these questions not only test your knowledge but also reinforce learning, making them an invaluable part of your digital electronics journey.

Stay committed to practicing diverse question types, keep your concepts clear, and approach each question logically to excel in digital circuit assessments.

QuestionAnswer What is a digital circuit? A digital circuit is a type of electronic circuit that processes digital signals, which have discrete levels (typically 0 and 1), to perform logical operations and data processing. Which logic gate outputs true only when all inputs are true? The AND gate outputs true only when all its inputs are true. What is the main difference between combinational and sequential circuits? Combinational circuits output depends only on current inputs, while sequential circuits depend on current inputs and past states (stored in memory elements). What is a flip-flop used for in digital circuits? A flip-flop is used as a memory element to store one bit of data, enabling sequential logic and state retention. Which digital logic family is known for its low power consumption and high speed? CMOS (Complementary Metal-Oxide-Semiconductor) logic family is known for low power consumption and high speed. What does a multiplexer (MUX) do in digital circuits? A multiplexer selects one input from multiple inputs based on selection lines and forwards it to the output. What is the purpose of a binary counter in digital electronics? A binary counter is used to count pulses or events, often for timing, frequency division, or sequencing applications. What is the significance of the truth table in digital logic design? A truth table defines the output of a logic circuit for all possible combinations of inputs, serving as a foundation for circuit design. Which type of flip-flop changes state on the rising edge of the clock signal? A positive-edge-triggered flip-flop changes state on the rising edge of the clock signal. What is the primary function of a digital decoder? A digital decoder converts binary input data into a corresponding output signal, typically activating one specific output line at a time.

Related keywords: digital circuit, objective questions, circuit analysis, logic gates, digital electronics, circuit design, Boolean algebra, digital logic, exam questions, answers

Objective part a

Objective Part A: A Comprehensive Guide to Understanding and Implementing It

Introduction to Objective Part A

In the realm of project management, strategic planning, and academic assessments, clarity of objectives is essential for success. Among the various components that constitute a well-structured plan or assessment, Objective Part A holds particular significance. It often serves as the foundational element that guides subsequent activities, evaluations, and outcomes. Understanding what Objective Part A entails, its purpose, and how to effectively implement it can markedly improve the quality and effectiveness of your projects or assessments.

This article delves into the intricacies of Objective Part A, providing insights into its definition,

importance, formulation, best practices, and real-world applications. Whether you are a student preparing for an exam, a project manager designing a new initiative, or a researcher drafting an academic paper, mastering Objective Part A is crucial for clarity and success.

What is Objective Part A?

Definition and Context

Objective Part A typically refers to the initial segment of a broader set of objectives within a project, study, or assessment. It is designed to specify a clear, concise goal that directs the subsequent activities. In many frameworks, Objective Part A serves as the primary or overarching objective, setting the tone and scope for the entire endeavor.

For example:

- In academic assessments, Objective Part A might ask students to identify key concepts or define core terms.
- In project planning, it might specify the primary aim of the project, such as increasing efficiency or expanding outreach.
- In research, Objective Part A could involve establishing hypotheses or foundational knowledge.

The purpose of Objective Part A is to establish a clear target that guides all subsequent efforts, ensuring that all stakeholders are aligned on the fundamental goal.

Importance of Objective Part A

The significance of Objective Part A cannot be overstated. It provides numerous benefits, including:

- **Clarity and Focus:** Clearly defined objectives help prevent scope creep and keep efforts aligned.
- **Measurement and Evaluation:** Well-formulated objectives enable effective assessment of progress and success.
- **Resource Allocation:** Knowing the primary goal helps in allocating time, budget, and human resources efficiently.
- **Motivation and Direction:** Clear objectives motivate team members by providing a shared understanding of the purpose.
- **Communication:** Objectives serve as a communication tool to inform stakeholders about the project's intent.

Without a well-defined Objective Part A, efforts may become scattered, inefficient, or misaligned with

overall goals.

Formulating Effective Objective Part A

Creating a compelling and actionable Objective Part A requires careful planning and consideration. The following guidelines can help craft objectives that are clear, measurable, and achievable.

Characteristics of a Good Objective Part A

A well-structured Objective Part A should be:

- Specific: Clearly defines what is to be achieved without ambiguity.
- Measurable: Allows for assessment through quantifiable indicators.
- Achievable: Realistic within the available resources and constraints.
- Relevant: Aligned with the broader goals and purpose.
- Time-bound: Includes a timeframe or deadline for completion.

This framework is often summarized as SMART objectives, which are widely used across project management and research.

Steps to Develop Objective Part A

- Identify the Main Goal: Understand the overarching purpose of your project or assessment.
- Conduct Background Research: Gather relevant data or literature to inform your objective.
- Define the Scope: Determine what is within and outside the scope of the objective.
- Draft the Objective Statement: Write a clear, concise statement that encapsulates the goal.
- Ensure SMART Criteria: Review the objective against SMART principles.
- Seek Feedback: Consult stakeholders or team members to refine the objective.
- Finalize the Objective: Confirm clarity, feasibility, and alignment before implementation.

Examples of Objective Part A Statements

- "To analyze the impact of social media marketing on consumer engagement within the retail sector over a six-month period."
- "To develop a prototype of a mobile application that enhances language learning for users aged 15-25 by the end of Q3."
- "To determine the effectiveness of the new training program in improving employee productivity within three months."

Implementing Objective Part A in Practice

Once formulated, implementing Objective Part A involves several strategic steps to ensure its success.

Aligning Team and Resources

- Communicate the objective clearly to all team members.
- Assign roles and responsibilities related to achieving the objective.
- Allocate necessary resources, such as budget, tools, or expertise.

Setting Milestones and Deadlines

- Break down the main objective into smaller, manageable tasks.
- Establish timelines for each task to keep progress on track.
- Regularly review milestones to assess progress and make adjustments.

Monitoring and Evaluation

- Develop key performance indicators (KPIs) linked to the objective.
- Use tools like progress reports, dashboards, or meetings to monitor advancement.
- Adjust strategies as needed based on ongoing evaluation.

Documenting and Reporting

- Keep detailed records of activities related to Objective Part A.
- Prepare reports highlighting achievements, challenges, and lessons learned.
- Share findings with stakeholders to demonstrate progress and accountability.

Common Challenges and How to Overcome Them

Despite careful planning, several challenges may arise when working with Objective Part A. Understanding these hurdles and solutions can enhance your success.

Vague or Overly Broad Objectives

- Challenge: Objectives that are too vague lead to confusion.
- Solution: Use the SMART framework to refine and specify the objective.

Unrealistic Expectations

- Challenge: Setting goals that are unattainable within constraints.
- Solution: Conduct feasibility assessments and adjust expectations accordingly.

Misalignment with Overall Goals

- Challenge: Objectives that do not support the broader mission.
- Solution: Ensure alignment through stakeholder consultation and strategic review.

Lack of Clear Metrics

- Challenge: Difficulty in measuring success.
- Solution: Define specific KPIs and establish measurement methods early on.

Conclusion: The Significance of Objective Part A

Mastering Objective Part A is fundamental for the success of any project, assessment, or research initiative. It serves as the compass guiding all subsequent activities, ensuring clarity, focus, and alignment among stakeholders. By adhering to best practices in formulation and implementation, and by anticipating common challenges, you can maximize the effectiveness of your objectives.

A well-crafted Objective Part A not only streamlines efforts but also enhances accountability and evaluability. Whether you are designing a new project, conducting research, or preparing an assessment, investing time and effort into defining a clear, measurable, and achievable Objective Part A will set the foundation for success. Remember, clarity at the outset paves the way for accomplishment and impactful results.

If you need further assistance on specific aspects of Objective Part A or examples tailored to your field, feel free to ask!

Objective Part A: A Comprehensive Analysis

Understanding the nuances of Objective Part A requires a thorough exploration of its design, purpose, and overall effectiveness within its intended context. This component, often integral to

broader assessments or systems, plays a crucial role in shaping outcomes, evaluating performance, or establishing foundational standards. In this review, we delve into the core aspects of Objective Part A, providing an in-depth analysis that considers its strengths, limitations, and potential areas for improvement.

Introduction to Objective Part A

Objective Part A typically functions as the initial segment of a larger evaluation or assessment framework. Its primary goal is to measure specific knowledge, skills, or competencies through clearly defined, objective criteria. Unlike subjective assessments, which rely on personal judgment, Objective Part A emphasizes standardized, measurable outcomes, often employing multiple-choice questions, true/false items, or matching exercises.

The importance of Objective Part A lies in its ability to provide a reliable baseline for further analysis. It offers quantifiable data that can inform decisions, identify areas of strength or weakness, and guide subsequent stages of evaluation. Its design often reflects a balance between comprehensiveness and efficiency, aiming to cover essential content without overburdening respondents.

Design and Structure of Objective Part A

The architecture of Objective Part A is pivotal to its effectiveness. Typically, it comprises a series of questions or tasks carefully curated to align with predefined learning objectives or competency standards. The design process involves multiple considerations:

- Content Validity: Ensuring that questions accurately represent the domain of knowledge or skills being assessed.
- Question Format: Utilization of multiple-choice, true/false, matching, or fill-in-the-blank formats, chosen for their objectivity and ease of scoring.
- Difficulty Level: A balanced mix of easy, moderate, and challenging items to differentiate levels of understanding or proficiency.
- Number of Items: Adequate quantity to ensure reliability without causing fatigue.

Features of Objective Part A:

- Standardized question types for consistent evaluation.
- Clear, concise wording to prevent misinterpretation.
- Randomization options to reduce predictability and cheating.

Pros of this structure:

- Objective measurement reduces scorer bias.
- Facilitates automated grading, increasing efficiency.
- Easily scalable for large populations.

Cons:

- May oversimplify complex understanding.
- Limited capacity to assess higher-order thinking skills.
- Risk of questions being too predictable if not well-designed.

Effectiveness and Reliability

One of the key strengths of Objective Part A lies in its reliability. Because scoring is straightforward and based on predetermined answers, it minimizes subjectivity and variability between evaluators. This consistency ensures that results are comparable across different administrations and populations.

Factors contributing to its effectiveness include:

- Standardization: Uniform testing conditions and question formats foster fairness.
- Objectivity: Eliminates personal bias in scoring.
- Quantifiability: Results are easily expressed numerically, aiding statistical analysis.

Empirical Evidence:

Studies have demonstrated high internal consistency in Objective Part A assessments, reflected in strong Cronbach's alpha coefficients. Moreover, test-retest reliability tends to be high when questions are well-constructed and aligned with learning objectives.

Limitations:

- Over-reliance on factual recall rather than critical thinking.
- Potential for guessing, which can inflate scores.
- Does not capture practical or applied skills effectively.

Content Coverage and Scope

Ensuring comprehensive coverage of the relevant subject matter is vital for Objective Part A to be meaningful. The design should reflect a balanced representation of core topics, avoiding overemphasis on trivial details or neglect of fundamental concepts.

Strategies for effective coverage:

- Bloom's Taxonomy alignment: Incorporate questions across different cognitive levels.
- Content mapping: Ensure all key areas are proportionally represented.
- Regular updates: Refresh questions to stay current with evolving standards.

Advantages:

- Provides a broad assessment of knowledge.
- Identifies specific content areas where learners struggle.

Drawbacks:

- Potential for superficial coverage if not carefully curated.
- Risk of bias if certain topics are over- or under-represented.

Implementation and Practical Considerations

Effective deployment of Objective Part A requires attention to logistical and operational elements:

- Test administration: Can be conducted online, on paper, or via computer-based testing centers.
- Time management: Sufficient time allocation to complete questions without undue pressure.
- Security measures: To prevent cheating, such as question randomization and secure testing environments.

Pros:

- Flexibility in administration modes.
- Scalable for large cohorts.

Cons:

- Technical issues can affect online assessments.
- Needs robust infrastructure and support.

Advantages and Disadvantages Summary

Advantages:

- High reliability and objectivity.
- Efficient scoring and data analysis.
- Suitable for large-scale assessments.

Disadvantages:

- Limited assessment of higher-order thinking skills.
- May encourage rote memorization rather than deep understanding.
- Potentially narrow scope if not carefully designed.

Potential Improvements and Future Directions

While Objective Part A serves as a robust foundation for assessment, there are areas where enhancements could bolster its effectiveness:

- Incorporating adaptive testing techniques to tailor difficulty based on respondent performance.
- Developing hybrid formats that combine objective items with brief, structured open-ended questions.
- Leveraging technology to include multimedia elements for richer assessments.
- Regularly reviewing and updating question banks to ensure relevance and accuracy.
- Integrating analytics to identify question performance and bias.

Conclusion

Objective Part A remains an essential component in the landscape of assessments, offering a reliable, efficient, and standardized approach to measuring foundational knowledge and skills. Its design principles prioritize fairness and consistency, making it a valuable tool for educators, administrators, and evaluators alike. However, to fully realize its potential, continuous refinement is

necessary?balancing objective measurement with the need to assess higher-order thinking, practical skills, and real-world application. Embracing technological advances and pedagogical insights will enable Objective Part A to evolve into a more comprehensive and nuanced evaluation instrument, ultimately serving the goal of fostering genuine understanding and competence.

Question What is the main focus of the Objective Part A in assessments? The main focus of Objective Part A is to evaluate the factual knowledge and understanding of key concepts related to the subject matter, often through multiple-choice or short-answer questions. **How can I effectively prepare for Objective Part A?** Effective preparation involves reviewing key topics, practicing past exam questions, understanding core concepts, and familiarizing yourself with the exam pattern to improve accuracy and confidence. **What types of questions are typically included in Objective Part A?** Objective Part A usually includes multiple-choice questions, true/false statements, and fill-in-the-blank questions designed to test foundational knowledge and quick recall. **Are there specific strategies to improve performance in Objective Part A?** Yes, strategies include practicing time management, focusing on high-yield topics, eliminating obviously incorrect options in multiple-choice questions, and reviewing explanations for mistakes. **How important is Objective Part A in overall exam scoring?** Objective Part A is often a significant component of the overall score, as it assesses core knowledge that underpins more complex understanding required in later parts of the exam. **Can Objective Part A questions be reused in multiple exams?** Some questions may be reused or adapted over time, but it's important to study a broad range of topics as exams typically include new or modified questions to assess ongoing understanding. **What are common pitfalls to avoid in Objective Part A?** Common pitfalls include rushing through questions, overthinking, neglecting to read questions carefully, and failing to manage time effectively during the exam. **How does mastering Objective Part A benefit overall exam performance?** Mastering Objective Part A helps build a strong foundation, boosts confidence, and can improve overall scores, making it easier to tackle more complex, subjective, or application-based questions later.

Related keywords: goal setting, performance criteria, evaluation metrics, assessment standards, target achievement, measurable outcomes, key performance indicators, deliverables, project milestones, success criteria

Read the full article online: [Objective Part A](#)