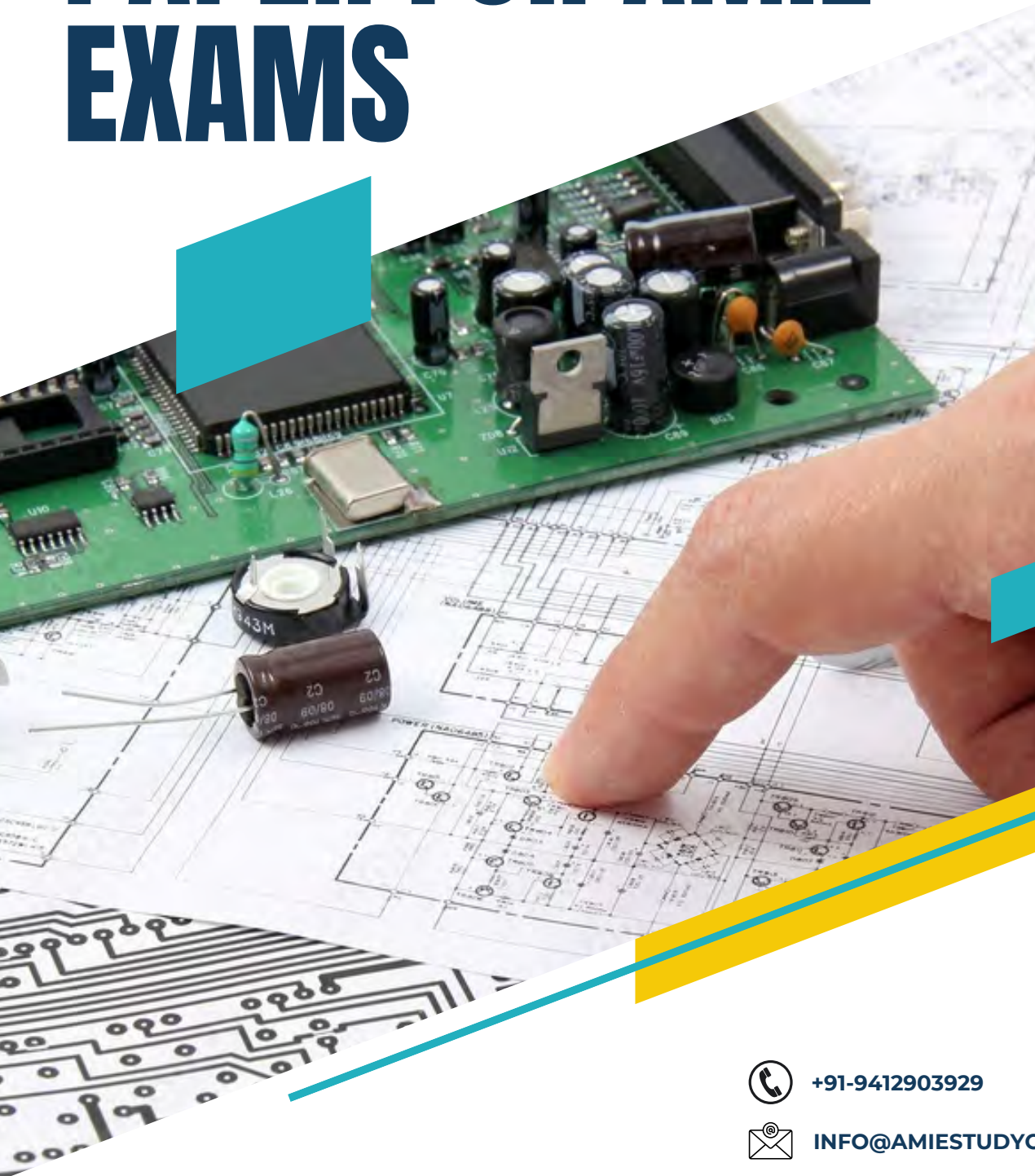


# MODEL TEST PAPER FOR AMIE EXAMS



## PULSE & DIGITAL CIRCUITS

TEST PAPER 1



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**PULSE & DIGITAL CIRCUITS***Time: Three Hours**Maximum Marks: 100*

*Answer five questions, taking ANY TWO from Group A, any two from Group B and all from Group C.*

*All parts of a question (a, b, etc. ) should be answered at one place.*

*Answer should be brief and to-the-point and be supplemented with neat sketches.*

*Unnecessary long answer may result in loss of marks.*

*Any missing or wrong data may be assumed suitably giving proper justification.*

*Figures on the right-hand side margin indicate full marks.*

**Group A**

1. (a) Transform the following: 8
  - (i)  $(6715)_8 = (-)_{10}$
  - (ii)  $(6A0C)_{16} = (-)_{10}$
  - (iii)  $(238)_{10} = (-)_{16}$
- (b) If  $X = 1010100$  and  $Y = 1000011$ , find  $(X - Y)$  and  $(Y - X)$  using (i) 1s complement method (ii) 2s complement method. Also give a design to have  $X.Y$  where “.” shows a binary multiplication. 6
- (c) Convert the following 6
  - (i)  $X = ABC + AD$  into SOP format
  - (ii)  $Y = (A + B + C)(A + D)$  into POS format.

Also minimise the function  $X + Y$  for Boolean  $X$  and  $Y$ .
2. (a) What do you mean by universal gates? Name universal gates. Justify your answer. Design the logic  $A + BC + \overline{A}\overline{C}$  using only NAND gates. 6
- (b) Define the following: 8
  - (i) Karnaugh map
  - (ii) Quine McClusky table
  - (iii) Negative OR logic gate

- (iv) Limitations of Karnaugh maps
- (c) Minimise the following switching functions using Karnaugh map. List all prime implicants and essential prime implicants (non redundant group). 6
- (i)  $F = \Sigma(1, 3, 5, 6, 7)$
- (ii)  $F = \Sigma(0, 1, 3, 6, 14, 15)$
3. (a) Define the terms “prime implement”, “non prime implement”, essential prime implicant” and “non essential prime implicant”. 10
- (b) Implement the function 10
- $$f = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}\overline{B}C\overline{D} + \overline{A}B\overline{C}\overline{D} + \overline{A}BC\overline{D} + A\overline{B}\overline{C}\overline{D} + ABC\overline{D} + A\overline{B}C\overline{D} + \overline{A}BCD$$
- using a 8 to 1 multiplexer with A, B and D as select inputs.
4. (a) Design a 4 to 1 multiplexer using 2 x 1 multiplexers and explain its functions. 10
- (b) What is ROM? How does it differ from RAM? Draw block diagram of ROM. 10

**Group B**

5. (a) Write short note on monostable multivibrator. 10
- (b) Convert the following: (i) SR to J-K flip flop (ii) D to S-R flip flop (iii) J-K flip flop to T flip flop. 10
6. (a) State the basic difference between a Mealy and a Moore model for representing a state diagram. Use the example of a D flip flop to illustrate this. Also draw the related excitation table. 10
- (b) Explain the following terms: 10
- (i) Synchronous sequential circuit
- (ii) Finite state machine
- (ii) Incompletely specified machine
- (iii) Compatible states

7. (a) What are asynchronous sequential circuits and their advantages? Draw the block diagram of such a circuit using the basic model for the fundamental mode circuit and explain its operation with reference to stable and unstable states. 10
- (b) Write notes on following: 10
- Deterministic recognisers
  - Graphs
  - Regular expressions
8. (a) What is the difference between synchronous and asynchronous counters. What are advantages of synchronous counter over asynchronous counter? 10
- (b) Design an asynchronous mod 9 counter using JK flip-flop. 10

**Group C**

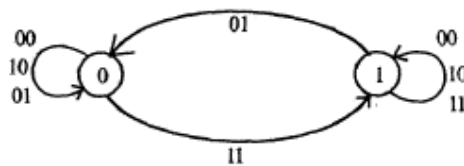
9. Answer the following in brief: 20
- $A + \bar{A}B$  is
    - A
    - B
    - $A + B$
    - $\bar{A} + \bar{B}$
  - In  $(0.3125)_{10} = (x)_2$  the value of x is
    - 0.0101
    - 0.1010
    - 0.1001
    - 0.0010
  - The canonical sum of product form of the function  $F = A + B$  is
    - $AB + A\bar{B} + \bar{A}B$
    - $AB + BA$
    - $AB + A\bar{B}$
    - $A\bar{B} + \bar{A}B$
  - The canonical product of sum form of  $F = (A + \bar{B})(B + C)$  is

- (a)  $(A + \bar{B} + C)(A + \bar{B} + \bar{C})$   
 (b)  $(A + \bar{B} + C)(A + \bar{B} + \bar{C})(A + B + C)(\bar{A} + B + C)$   
 (c)  $(A + \bar{B} + C)(A + \bar{B} + \bar{C})(A + B + C)$   
 (d)  $(A + \bar{B} + \bar{C})(\bar{A} + B + C)$

(v) The JK flip flop acts as a T flip flop when

- (a)  $J = 1, K = 0$   
 (b)  $J = 0, K = 0$   
 (c)  $J = 1, K = 1$   
 (d)  $J = 0, K = 1$

(vi) The state diagram of an asynchronous sequential circuit is shown below.



The number of outputs of the circuit is

- (a) 2  
 (b) 4  
 (c) 6  
 (d) 1
- (vii) Multiplexer can be expressed as
- (a) one-to-many  
 (b) many to one  
 (c) many to many  
 (d) one to one
- (viii) Tabular method of simplification is convenient as long as the number the number of variables does not exceed
- (a) 6  
 (b) 8  
 (c) 10  
 (d) 12
- (ix) The characteristic equation of a T flip flop is

- (a)  $T \oplus Q_n$
  - (b)  $T + Q_n$
  - (c)  $TQ_n$
  - (d) none of these
- (x) Hazards in switching circuits are caused by
- (a) varying input signal
  - (b) constant output
  - (c) zero propagation time
  - (d) delays of switching components

*(Refer our course material for answers)*