महाराष्ट्र शासन
शालेय शिक्षण व क्रीडा विभाग
राज्य शैक्षणिक संशोधन व प्रशिक्षण परिषद, महाराष्ट्र पुणे
७०८ सदाशिव पेठ, कुमठेकर मार्ग, पुणे ४११०३०
संपर्क क्रमांक (०२०) २४४७ ६९३८ E-mail: mathsdept@maa.ac.in

जा.क्र. राशैसंप्रपम /गवि/प्रश्नपेढी /२०२२-२३ दि.

इयत्ता:- बारावी

विषय:- गणित (Arts and Science Stream)

सूचना-

१. सदर प्रश्नपेढी ही १००% अभ्यासक्रमावर तयार करण्यात आली आहे.
२. सदर प्रश्नपेढीतील प्रश्न हे अधिकच्या सरावासाठी असून प्रश्नसंचातील प्रश्न बोर्डाच्या प्रश्नपत्रिकेत येतीलच असे नाही, याची नोंद घ्यावी.

Maharashtra State Council of Educational research and Training
Pune

QUESTION BANK

STD XII Arts and Science Stream

MATHEMATICS AND STATISTICS (40)

Part-I

1. MATHEMATICAL LOGIC

Q1) Select and write the most appropriate answer from the given alternatives:

i) Which of the following statement is true?
   a) 3 + 7 =4 or 3 – 7 = 4
   b) If Pune is in Maharashtra, then Hyderabad is in Kerala
   c) It is false that 12 is not divisible by 3
   d) The square of any odd integer is even.

ii) Which of the following is not a statement?
   a) 2+2 =4
   b) 2 is the only even prime number
   c) Come here
   d) Mumbai is not in Maharashtra

iii) If p is any statement then ($p \vee \sim p$) is a
   a) Contingency
   b) Contradiction
   c) Tautology
   d) None of these

iv) If p and q are two statements , then ($p \rightarrow q$) $\leftrightarrow$ ($\sim q \rightarrow \sim p$) is
   a) Contradiction
   b) Tautology
   c) Neither (i) nor (ii)
   d) None of these

v) Negation of $p \rightarrow (p \vee \sim q)$ is
   a) $\sim p \rightarrow (\sim p \vee q)$
   b) $p \wedge (\sim p \wedge q)$
   c) $\sim p \vee (\sim p \vee \sim q)$

d) ~p → (~p → q)

vi) If p : He is intelligent
q : He is strong
Then, symbolic form of statement "It is wrong that, he is intelligent or strong " is
a) ~p ∨~q
b) ~(p ∧ q)
c) ~(p ∨ q)
d) p ∨~q

vii) A biconditional statement is the conjunction of two ---------- statements
a) Negative
b) Compound
c) Connective
d) Conditional

viii) If p → q is an implication , then the implication ~q → ~ p is called its
a) Converse
b) Contrapositive
c) Inverse
d) Alternative

ix) The negation of the statement (p ∧ q) → (r ∨ ~p)
a) p ∧ q∧ ~ r
b) (p ∧ q) ∨ r
c) p ∨ q ∨ ~ r
d) (p v q) ∧ (r ∨ s)

x) The false statement in the following is
a) p ∧ (~p) is contradiction
b) (p → q) ↔ (~ q → ~p) is a contradiction
c) ~ (~p) ↔ p is a tautology
d) p ∨ (~p) ↔ p is a tautology

xi) The dual of statement $p \wedge [\sim q \vee (p \wedge q) \vee \sim r]$ is

A) $p \wedge [\sim q \wedge (p \wedge q) \wedge \sim r]$ B) $p \vee [\sim q \wedge (p \vee q) \wedge \sim r$

C) $p \wedge [\sim q \wedge (p \vee q) \wedge \sim r$ D) $p \vee [\sim q \wedge (p \wedge q) \wedge \sim r]$

xii) The dual of statement $p \rightarrow q$ is

A) $p \wedge \sim q$ B) $q \rightarrow p$

C) $p \vee \sim q$ D) $\sim p \wedge q$

xiii) The dual of a statement $p \wedge \sim p$ is

A) a tautology B) a contradiction

C) Neither tautology nor contradiction D) tautology as well as contradiction

Q 2) Attempt the following 1 marks

i) Find the negation of 10 + 20 = 30
ii) State the truth Value of $x^2 = 25$
iii) Write the negation of $p \rightarrow q$
iv) State the truth value of $\sqrt{3}$ is not an irrational number
v) State the truth value of $(p \vee \sim p)$
vi) State the truth value of $(p \wedge \sim p)$

Q3) Attempt the following 2 marks

i) : If statements p, q are true and r, s are false, determine the truth values of the following.

a) $\sim p \wedge (q \vee \sim r)$ b) $(p \wedge \sim r) \wedge (\sim q \vee s)$

ii) Write the following compound statements symbolically.

a) Nagpur is in Maharashtra and Chennai is in Tamilnadu.

b) Triangle is equilateral or isosceles.

iii) . Write the converse and contrapositive of the following statements.

"If a function is differentiable then it is continuous".

iv) Without using truth table prove that :

$\sim (p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

Answers

i) a) F b) F ii) a) $p \wedge q$ b) $p \vee q$

ii) converse: If function is continuous then it is differentiable.
Contrapositive: If function is not continuous then it is not differentiable.

Q4) Answer the following questions

i) Write the negation of the statement " An angle is a right angle if and only if it is of measure 90^0"

ii) Write the following statements in symbolic form
   a) Milk is white if and only if the sky is not blue
   b) If Kutab – Minar is in Delhi then Taj- Mahal is in Agra
   c) Even though it is not cloudy , it is still raining

iii) Use quantifiers to convert the given open sentence defined on N into a true statement
   a) $n^2 \geq 1$
   b) $3x - 4 < 9$
   c) $Y + 4 > 6$

iv) Examine whether the statement pattern is a tautology, contradiction or contingency
$(p \wedge \sim q) \rightarrow (\sim p \wedge \sim q)$

v) Using truth table prove that $\sim p \wedge q \equiv (p \vee q) \wedge \sim p$

vi) Write the dual of the following
   a) 13 is prime number and India is a democratic country
   b) $(p \wedge \sim q) \vee (\sim p \wedge q) \equiv (p \vee q) \wedge \sim (p \wedge q)$

vii) Write the converse, inverse and contrapositive of the statement "If it snows, then they do not drive the car"

viii) Write the dual of the following statement

7 is a prime number but 9 is not divisible by 2.

Q5) Answer the following questions

i) Examine whether the statement pattern

$[p \rightarrow (\sim q \vee r)] \leftrightarrow \sim[p \rightarrow (q \rightarrow r)]$ is a tautology, contradiction or contingency.

ii) Using truth table prove that $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

iii) Without using truth table show that
$(p \vee q) \wedge (\sim p \vee \sim q) \equiv (p \vee \sim q) \wedge (\sim p \vee q)$

iv) With proper justification state the negation of
$(p \leftrightarrow q) \vee (\sim q \rightarrow \sim r)$

v) Prepare truth table for $(p \wedge q) \vee \sim r$

vi) Express the following circuits in the symbolic form of logic and write the input-output table.