Maths Sample Test.

Date No

(01) $p \rightarrow (p \rightarrow q)$

p	q	$p \rightarrow q$	$p \rightarrow (p \rightarrow q)$
1	1	1	1
1	0	0	0
0	1	1	1
0	0	1	1

(a) Satisfiable → means at least one output has to be true.

* This proposition is Satisfiable since there are 3 true values in output.

(b) Unsatisfiable → All the values in output are false.

* This is not unsatisfiable.

(c) Valid → All the values in output have to be true.

* This is not valid since this has one false output.

(d) An axiom → The propositions that can accept without evidens.

* This is not an axiom since we have to draw the truth table

∴ So the ~~as~~ answer is (a) Satisfiable.

02). p - Sam is studying Math
q = Pat is studying English.

Either Sam is studying Math and Pat is not studying English or Pat is studying English.

* Sam is studying Math AND Pat is ~~D~~Not studying Eng.
$(p \wedge \neg q)$

* OR pat is studying Eng. $= \vee q$.

∴ The answer $\rightarrow (p \wedge \neg q) \vee q$ → ~~(c)~~ answer (d)

03). p → x is an even number
q → x is divisible by 4.

(a) $(p \wedge q) \wedge \neg q$

p	q	$p \wedge q$	$\neg q$	$(p \wedge q) \wedge \neg q$
1	1	1	0	0
1	0	0	1	0
0	1	0	0	0
0	0	0	1	0

All values are false.
So this is unsatisfiable

* All other 3 propositions have at least one true output value.

So the ~~asnte~~ answer is (a) $(p \wedge q) \wedge \neg q$

(04) $[(p \rightarrow q) \wedge \neg p] \rightarrow \neg q$ is False.

(*) To be this false,
$[(p \rightarrow q) \wedge \neg p]$ has to be true and $\neg q$ has to be false.

p	q	$q p \rightarrow q$
1	1	1
1	0	0
0	1	0
0	0	0

(*) So $\neg q$ is false.
that means q is true.

(*) And to be $(p \rightarrow q) \wedge \neg p$ true,
$(p \rightarrow q) \rightarrow$ true and $\neg p \rightarrow$ true.

p	q	$p \wedge q$
1	1	1
1	0	0
0	1	0
0	0	0

(*) That means $\neg p$ is ~~false~~ true.
$\therefore$ p is ~~True~~ false.

(*) As well, $(p \rightarrow q) \wedge \neg p$ is true.

} So the answer is (a).

(05) p → Tony is playing cricket q → Tony is playing tennis.

(i) Tony is playing cricket or not playing tennis.
(ii) If ~~it~~ Tony is playing tennis then not playing cricket.
} KB Part.

There for Tony is playing cricket. (p).
↳ This is the consequnce part

(i) $p \vee \neg q$ (ii) $q \rightarrow \neg p$.

So, for the logical consequnce we have to combind them from AND.

$[(p \vee \neg q) \vee q \rightarrow \neg p] \rightarrow p$.

So the answer is (b).

(06) $A = \{a, 2a, 3a\}$ $B = \{b, ab, a+b\}$

$a = 2$ and $b = 3$.

(*) $A \cup B$

= That means all the elements of ~~Set~~ both sets.

$A \cup B = \{a, 2a, 3a, b, ab, a+b\}$.

$= \{2, 4, 6, 3, 6, 5\}$.

But we can't have the same eliment twice. So,

$A \cup B = \{2, 4, 6, 3, 5\}$.

(*) $A \cap B$

→ That means only the common eliments.

$A \cap B = \{6\}$.

$A = \{2, 4, 6\}$

$B = \{3, 6, 5\}$.

So the answer is (b).

(07) $A = \{x \in \mathbb{N} \mid x < 5\}$ $B = \{y \in \mathbb{N} \mid 3 \leq y < 6\}$.

$U = \{x \in \mathbb{N} \mid x < 7\}$.

$A = \{1, 2, 3, 4, 5\}$

$U = \{1, 2, 3, 4, 5, 6\}$.

$B = \{3, 4, 5\}$.

$(A \cup B)^c = U - (A \cup B)$

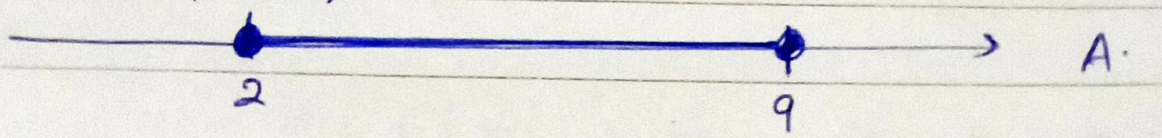
$= \{6\}$

* To find the complement of a set, we have to minus that ~~set~~ from the universal set.

So the answer is (c).

(09) $A = \{x \in \mathbb{R} \mid 2 \leq x \leq 9\}$ $B = \{x \in A \mid x^2 \in A\}$?

~~$A = \{2, 3, 4, 5, 6\}$~~



If we take $x = 2$ then $x^2 = 2^2 = 4$ it's in this lin

And again $x = 3$ then $x^2 = 3^2 = 9$

So if $x > 3$ then x^2 will be > 9.

So the interval is $[2, 3]$ Answer (c).

(10) $A = \{(x, y) : x \in \mathbb{N}, y \in \mathbb{N}, 1 < x \leq y < 4\}$.

$y = 3, 2, 1$ and $x \leq y$

So $A = \{(3, 2), (2, 2), (3, 3)\}$ Answer (c).

(11) $A = \{(x,y) \mid x \in \mathbb{N},\ y \in \mathbb{N},\ 2 < x \leq y < 5\}$.
$B = \{(x,y) \mid x \in \mathbb{N},\ y \in \mathbb{N},\ 2 < x < y < 5\}$.

$A \rightarrow \{\ y = 5, 4, 3, 2, 1 \qquad x = 4, 3, 2\}$

$A = \{(3,3), (\text{illegible}), (4,4)\}$.

$B \rightarrow \quad x = 3, 4 \qquad y = 1, 2, 3, 4, 5$

$B = \{(3,4)\}$.

So $A \cup B = \{(3,3), (4,4), (3,4)\}$. Answer (d)

(12) $A = \{0, 1\}$
$R = \{(x,y) \mid x, y \in A;\ x+y = 0\}$.

If $x+y = 0$ and $x, y \in A$, x and y both have to be 0.

$x = 0 \qquad y = 0 \qquad$ So $x+y = 0$.

That means, $x = y = 0$. and $x+y = 0$.
So this is Symmetric. [If $x = y$ then $y = x$].

As well $x = y$. That means $(x,x) \in R$
So this is Reflextive.

Since $x = y$, if $x = z$ then $y = z$.
This is Trasitive as well.

(*) This is Symmentric, Transitive and Reflextive.
That means this is Equivalence.

Answer (d).

In this question we can have any answer (d) and (e) Any descriptions

(13) $A = \{a, b\}$ $B = \{1, 2\}$.

(a) $\{(a,1), (a,2), (b,1), (b,2)\}$.
This is not a function.
Since in a function, we can't have the same input more than once.

(b) $\{(a,1), (b,1)\}$.
This is a function.
And the Domain is A, codomain is B.

So the answer. Answer (b).

(14) $A = \{a, b, c\}$ $B = \{0, 1\}$.

(a) $\{(a, 0), (c, 0)\}$
This is a function and
Domain is A, codomain is B.

(b) $\{(a,1), (b,0), (b,1)\}$
This is not a function as can't use the same input twice.

So the answer (a).

(15) $A = \{a, b, c\}$ $B = \{0, 1\}$

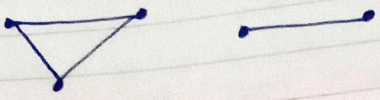
(i) $\{(0,a), (1,b)\}$ This is a function, but ~~This 0 is from Co domain. So this is wrong.~~
Domain is B and Codomain is A.

(ii) $\{(0,a), (0,b), (1,c\}$ → This is not a function.

(iii) $\{(a,0), (b,1), (c,0)\}$
This is a function and Domain is A, Codomain is

So the answer → (c).

(16).



This is disconnected.
Since not all the edges are connected.

And this is cyclic.
Since there is one cycle.

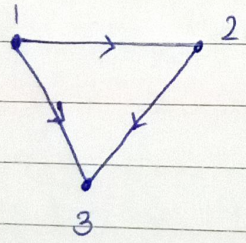
So the answer → (c).

(17). V = {bread (1), chicken rice (2), chicken kottu (3)}

prizes (1) Rs. 250 (2) Rs. 250 (3) Rs. 300

E = {(x,y) | x ∈ V, y ∈ V, x is cheaper or same prize}.

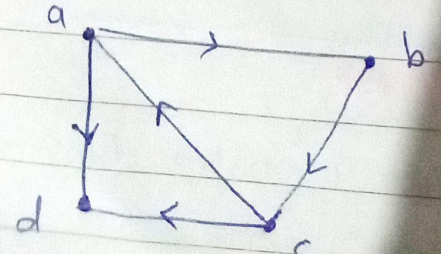
E = {(1,2), (1,3), (2,3)}.



Answer (a).

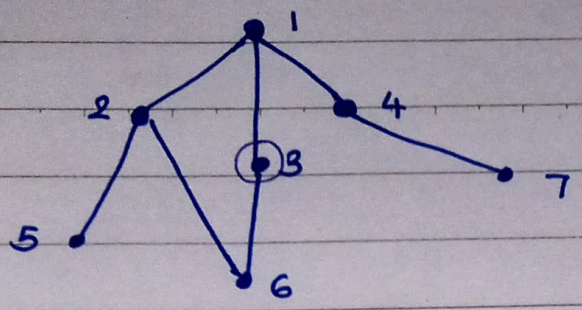
(18). V = {a, b, c, d}

E = {(a,b), (b,c), (c,a), (a,d)}, (c,d)}



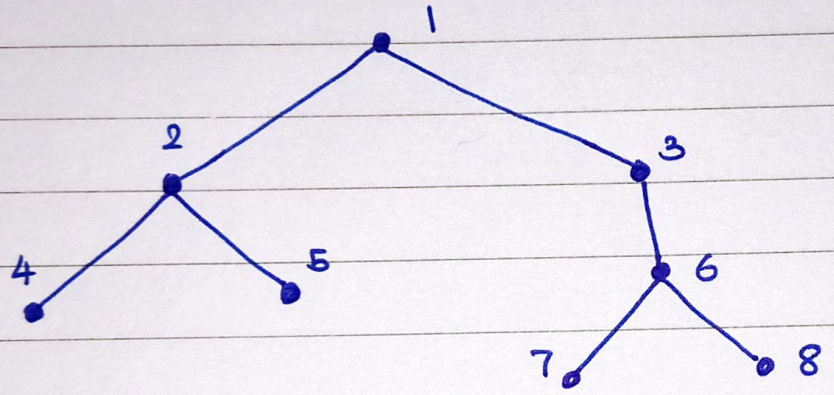
Answer (a).

(19)



This is not a tree.
A leaf can't have 2 parents.
leaf 3 has 2 parents 1 and 2. So this is not a tree.

(20)



This is not a binary tree since root 3 has only divided in to one parth.

And the depth of this tree is 3.

So the answer is (b).