DISCRETE MATHEMATICS. Graphs. Main definitions. Homework	serie	var
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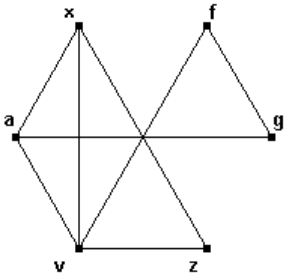
Graph $G_1 = (V, E_1)$
is defined by $V = \{g, f, x, a, v, z\}$,
its vertex and $E_1 = \{\{g, x\}, \{f, a\}, \{f, z\}, \{x, a\}, \{x, v\}, \{x, z\}\}$.
edge sets:

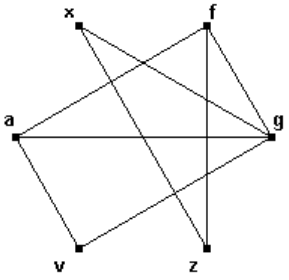
Graphs $G_2 = (V, E_2)$ and $G_3 = (V, E_3)$ are defined by adjacency and incidence matrices:

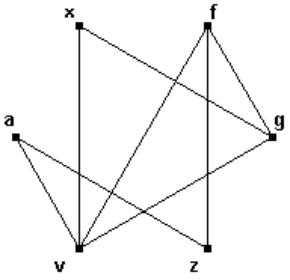
$$\begin{pmatrix} 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \quad \begin{pmatrix} 1 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

1 Edge set of graph $G = ((G_1 \cup G_2) \oplus G_3) \cup (V, \emptyset)$ is
① $\{\{g, f\}, \{g, x\}, \{g, v\}, \{f, v\}, \{f, z\}, \{x, v\}, \{a, v\}, \{a, z\}\}$;
② $\{\{g, f\}, \{g, x\}, \{g, a\}, \{g, v\}, \{f, a\}, \{f, z\}, \{x, z\}, \{a, v\}\}$;
③ $\{\{g, f\}, \{g, a\}, \{f, v\}, \{x, a\}, \{x, v\}, \{x, z\}, \{a, v\}, \{v, z\}\}$.

2 Graph $G = ((G_1 \cup G_2) \oplus G_3) \cup (V, \emptyset)$ is presented on picture

① 

; ② 

; ③ 

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3 Graph $(\{g, z, q\}, \emptyset)$ is ① bipartite; ② null; ③ complete; ④ empty.

4 Distance between graph's $(\{v, t, q, p\}, \{\{v, t\}, \{t, q\}, \{t, p\}\})$ vertices q and p is
① three; ② one; ③ zero; ④ two.

5 Graph's $(\{t, z, x, v\}, \{\{t, z\}, \{z, x\}, \{x, v\}, \{z, v\}\})$ radius is
① zero; ② three; ③ two; ④ four; ⑤ one.

6 Graph's $(\{v, s, p\}, \{\{v, s\}, \{s, p\}\})$ diameter is
① four; ② zero; ③ two; ④ three; ⑤ one.

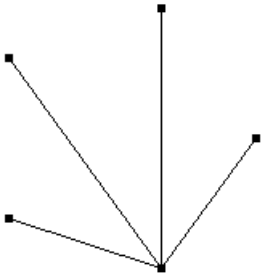
$G = (V, E)$ is undirected connected graph; $|V| = 58$.
The sequence of graphs vertex degrees is $(2, 2, 2, 2, \ldots, 2, 2, 2, 1, 1,)$.

7 Radius of this graph is ① 30; ② 1; ③ 29; ④ 60; ⑤ 58; ⑥ 57.

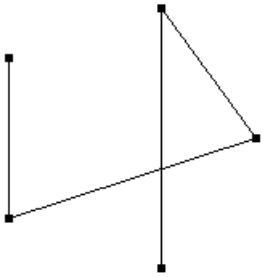
8 How many articulations has graph
$G = (\{r, x, w, q\}, \{\{r, x\}, \{x, w\}, \{q, x\}\})$?
① three; ② four; ③ one; ④ two; ⑤ five; ⑥ no one.

Graph G is defined by vertex neighbor sets
$\Gamma(y) = \{z, c\},\ \Gamma(z) = \{n, y\},\ \Gamma(m) = \{c\},$
$\Gamma(c) = \{y, m\},\ \Gamma(n) = \{z\}.$

9 For which graph shown in the figures, is isomorphic graph G ?



(A)



(B)

① (A); ② (A) and (B); ③ (B); ④ no one.

10 Distance between graph's G vertices $\rho(z, n) =$
① 4; ② 2; ③ 3; ④ 12; ⑤ 0; ⑥ 1.

11 Eccentricity of vertex m , $e(m) =$
① 3; ② 0; ③ 1; ④ 7; ⑤ 4; ⑥ 5.

12 Diameter of graph G is
① 6; ② 1; ③ 4; ④ 8; ⑤ 2; ⑥ 5.

13 Radius of graph G is equal to
① 6; ② 7; ③ 2; ④ 11; ⑤ 0; ⑥ 1.

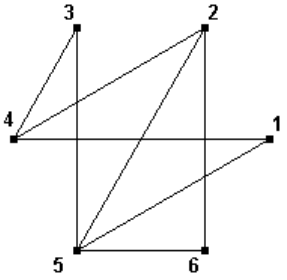
14 How many centers has graph G ?
① 4; ② 6; ③ 7; ④ 1; ⑤ 9; ⑥ 0.

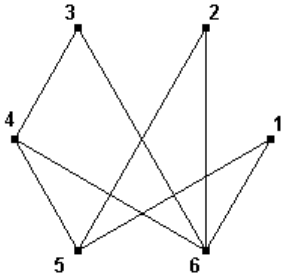
15 How many bridges has graph G
$G = (\{s, t, p, y\}, \{\{s, t\}, \{t, p\}, \{p, y\}, \{s, y\}\})$?
① no one; ② six; ③ two; ④ one; ⑤ five; ⑥ three; ⑦ four.

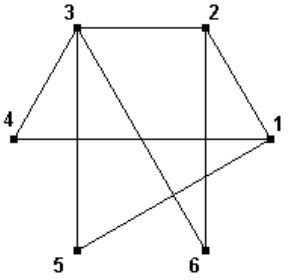
Graph G with vertices $1, 2, \ldots, 6$ is defined by adjacency matrix

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 1 & 0 & 0 \end{pmatrix} .$$

16 This graph is presented on picture

① 

; ② 

; ③ 

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17 How many articulations has graph G ?
① 8; ② 5; ③ 0; ④ 1; ⑤ 3; ⑥ 6.

18 How many bridges has graph G ?
① 5; ② 0; ③ 4; ④ 8; ⑤ 6; ⑥ 2.

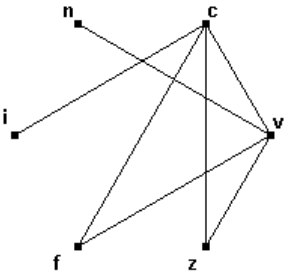
19 How many edges has graph $\tilde{G} = G - 4 - \{3, 6\}$.
① 8; ② 2; ③ 3; ④ 6; ⑤ 4; ⑥ 7.

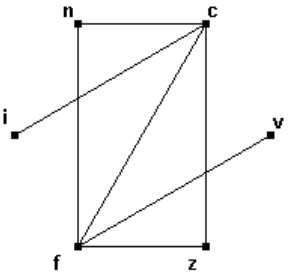
20 How many connected components has graph $\tilde{G}$?
① 5; ② 2; ③ 4; ④ 9; ⑤ 0; ⑥ 7.

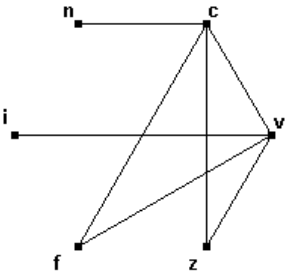
Graph $G = (V, E)$ is defined by vertex and edge sets:

$V = \{v, c, n, i, f, z\}$,
$E = \{\{v, c\}, \{v, n\}, \{v, f\}, \{v, z\}, \{c, i\}, \{c, f\}, \{c, z\}\}$.

21 This graph is presented on picture

① 

; ② 

; ③ 

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22 Which proposition is true?
(A) Vertex set $S = \{i, z, f\}$ is stable set.
(B) Set S is dominating set.
① (A); ② no one ; ③ both; ④ (B).

23 Graph's G stability number is ?
① 4; ② 6; ③ 2; ④ 7; ⑤ 5; ⑥ 1.

24 Graph's G domination number is ?
① 11; ② 2; ③ 1; ④ 3; ⑤ 7; ⑥ 0.

Graph G is defined by vertex neighbor sets:
$\Gamma(e) = \{z\}$, $\Gamma(z) = \{e, h, t\}$, $\Gamma(t) = \{z, f, q, h, x\}$, $\Gamma(h) = \{z, t\}$, $\Gamma(x) = \{f, t\}$, $\Gamma(f) = \{t, x\}$, $\Gamma(q) = \{t\}$.

25 Length of longest open cirquit in graph G is

① four; ② two; ③ six; ④ one; ⑤ three; ⑥ eight; ⑦ seven; ⑧ five.

26 Which proposition is true?
(A) Graph's G domination number is two;
(B) Graph's diameter is three.

① both; ② (B); ③ no one ; ④ (A).

27 Graph G has _____ centers.

① eight; ② three; ③ five; ④ four; ⑤ one; ⑥ two; ⑦ seven; ⑧ six.

28 Which proposition is true?
(A) Graph's G edge set $\{\{z, h\}, \{x, t\}\}$ is a cut;
(B) Graph G has 2 articulations.

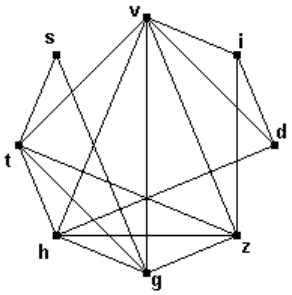
① (B); ② no one ; ③ (A); ④ both.

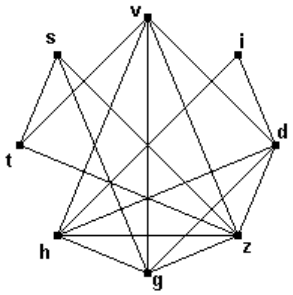
29 Graph G has _____ blocks.

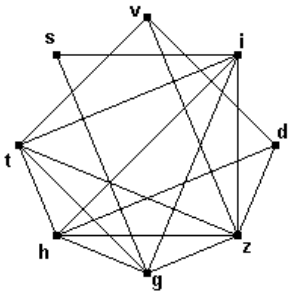
① one; ② four; ③ three; ④ two; ⑤ five; ⑥ seven; ⑦ eight; ⑧ six.

Graph G with vertices $1, 2, \ldots, 6$ has edges
$d = \{1, 3\}$, $i = \{1, 5\}$, $v = \{1, 6\}$, $s = \{2, 4\}$,
$t = \{2, 6\}$, $h = \{3, 6\}$, $g = \{4, 6\}$, $z = \{5, 6\}$.

30 Graph's G edge graph G_b is presented on picture

① 

; ② 

; ③ 

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