

Расчетно-проектировочная

работа n 4

Расчет балок на изгиб

Задание содержит две задачи:

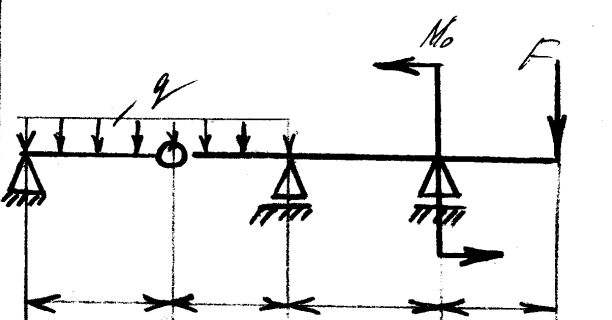
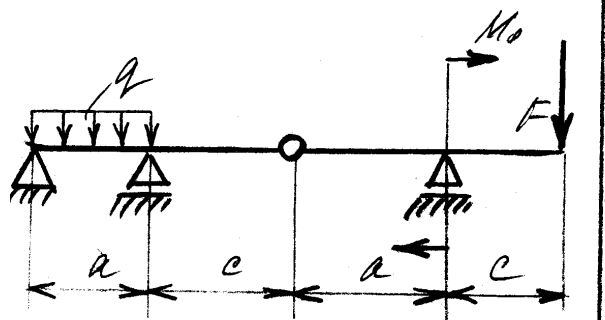
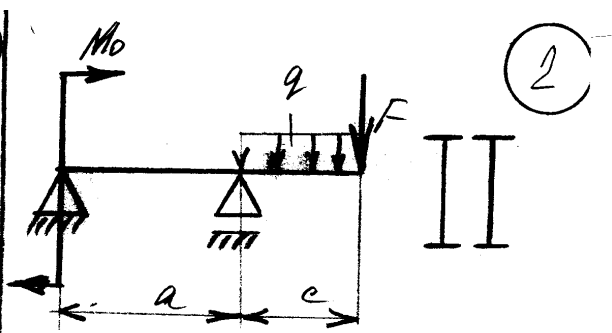
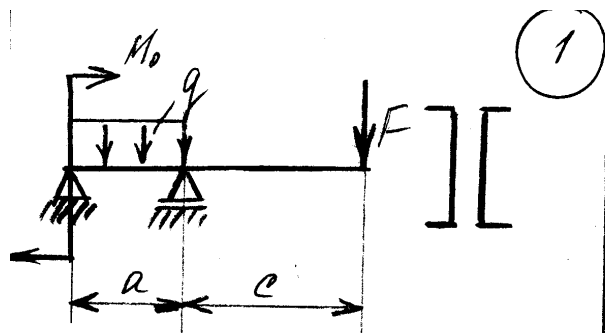
Задача 1. Определить максимальное напряжение в
составной балке и запас прочности, если $\sigma_{adm} = 180 \text{ МПа}$,

Задача 2. а) подобрать номер двутавра, если

$\sigma_{adm} = 180 \text{ МПа}$;

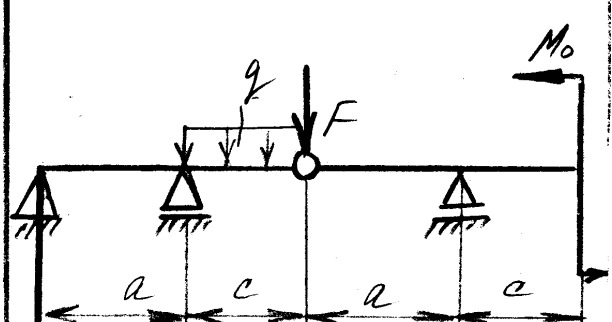
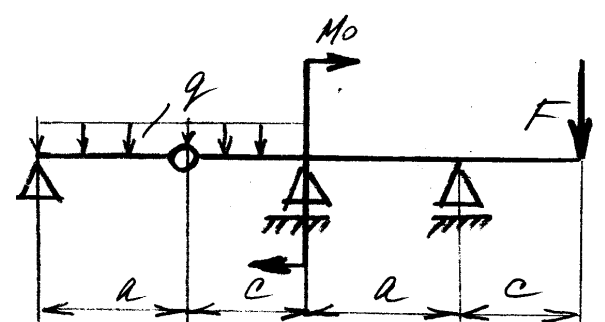
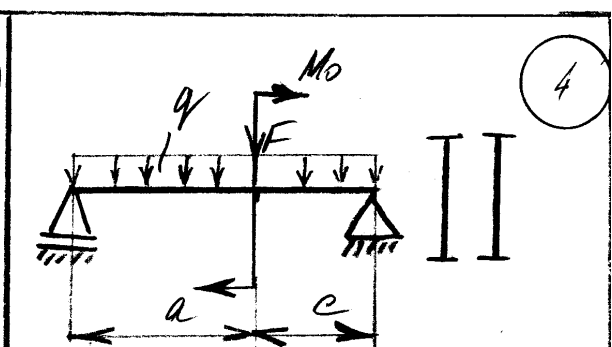
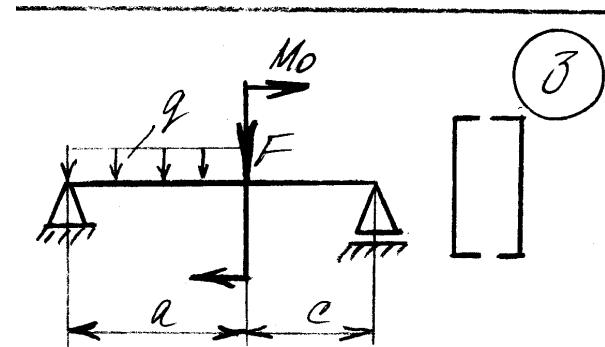
б) определить угол поворота сечения и прогиб на
конце консоли и в шарнире;

в) показать ориентировочно изогнутую ось
балки.



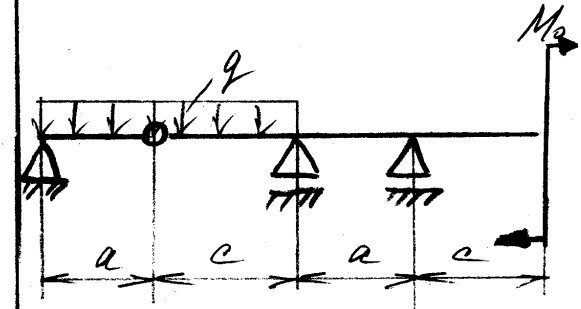
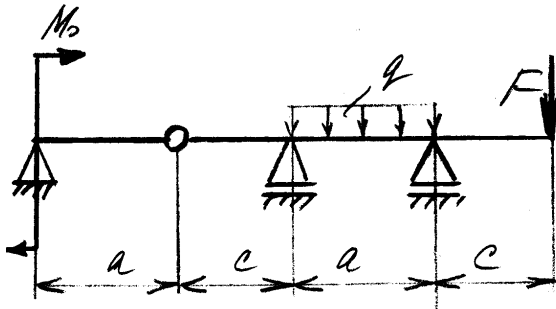
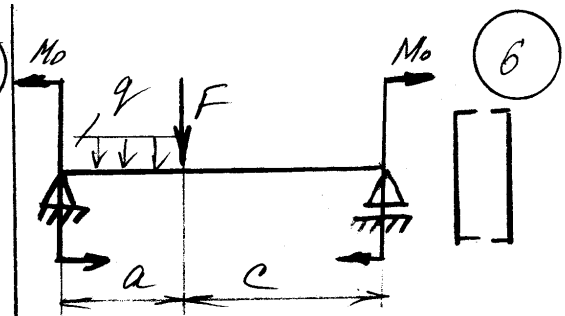
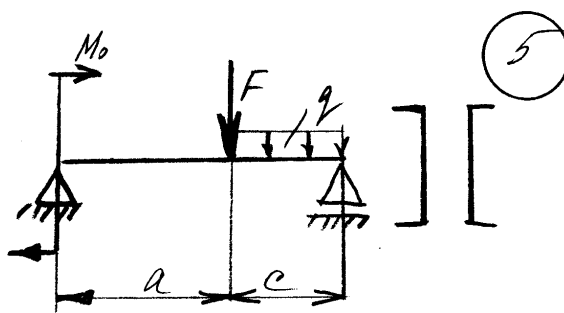
$q = 6 \text{ kH/M}; F = 10 \text{ kH}; M_0 = 12 \text{ kHM}$
 $a = 2,4 \text{ M}; c = 1,5 \text{ M}$

$q = 8 \text{ kH/M}; F = 12 \text{ kH}; M_0 = 14 \text{ kHM}$
 $a = 2,3 \text{ M}; c = 1,8 \text{ M}$



$q = 10 \text{ kH/M}; F = 14 \text{ kH}; M_0 = 12 \text{ kHM}$
 $a = 2,2 \text{ M}; c = 1,7 \text{ M}$

$q = 12 \text{ kH/M}; F = 10 \text{ kH}; M_0 = 16 \text{ kHM}$
 $a = 2,2 \text{ M}; c = 1,6 \text{ M}$

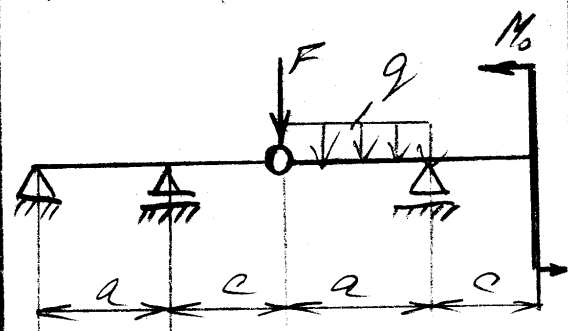
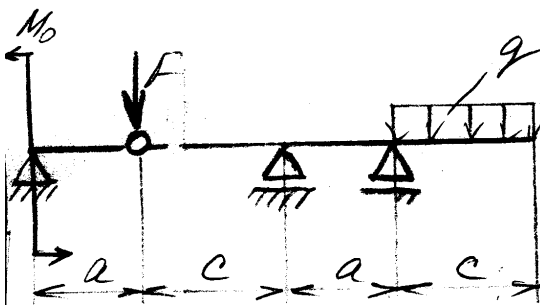
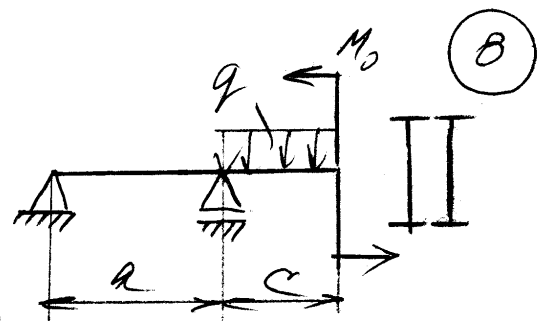
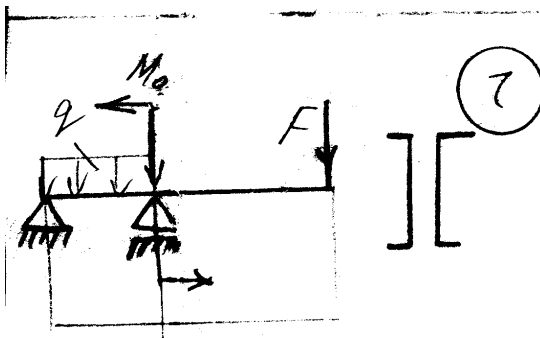


$$q = 12 \text{ kH/M}; F = 8 \text{ kH}; M_0 = 6 \text{ kHM}$$

$$q = 18 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 8 \text{ kHM}$$

$$a = 2.4 \text{ M}; c = 1.6 \text{ M}$$

$$a = 1.7 \text{ M}; c = 2.2 \text{ M}$$

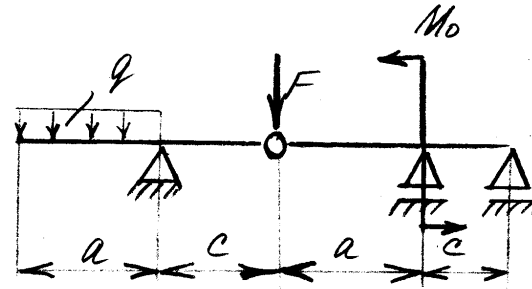
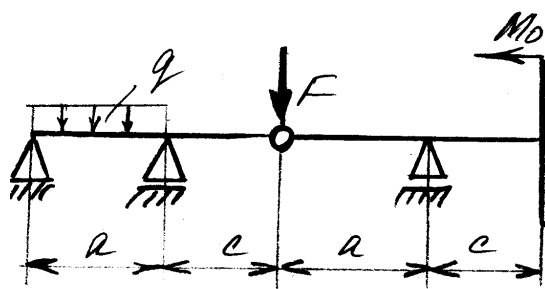
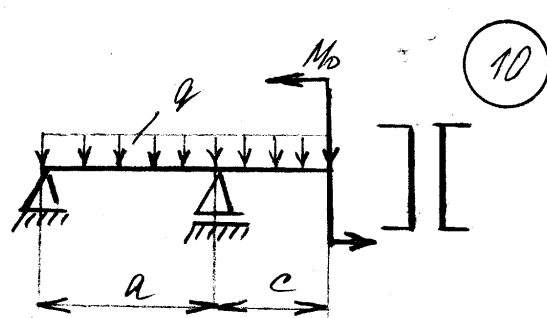
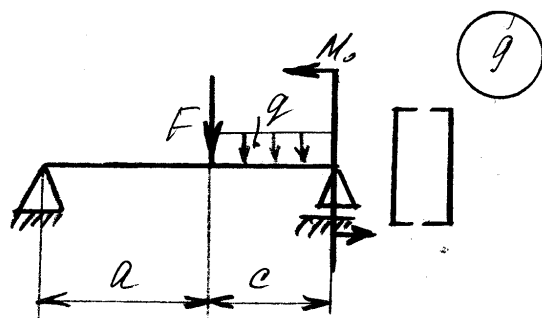


$$q = 26 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 12 \text{ kHM}$$

$$q = 22 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 20 \text{ kHM}$$

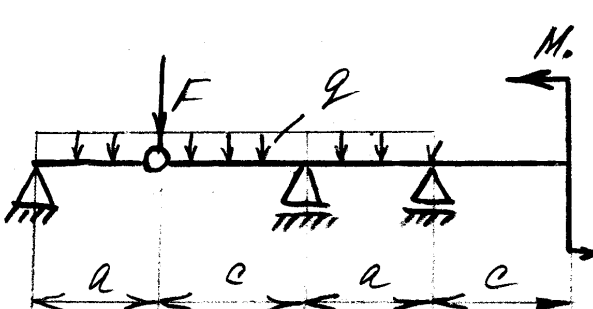
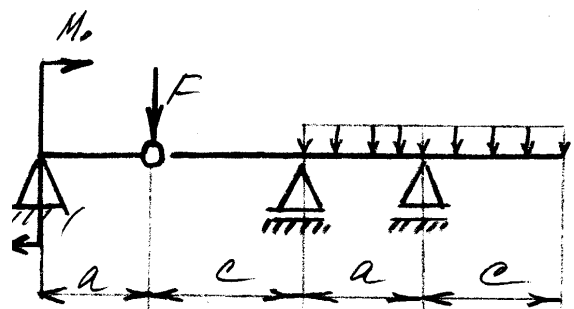
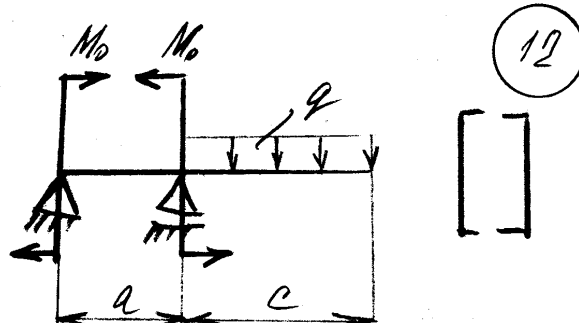
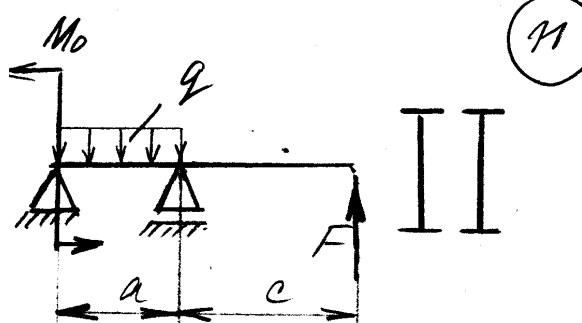
$$a = 1.4 \text{ M}; c = 2 \text{ M}$$

$$a = 1.9 \text{ M}; c = 1.4 \text{ M}$$



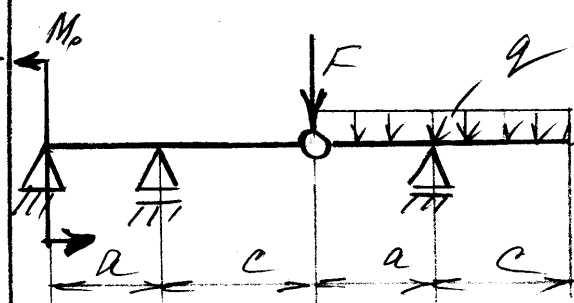
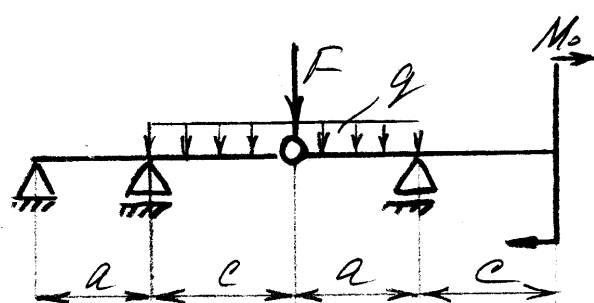
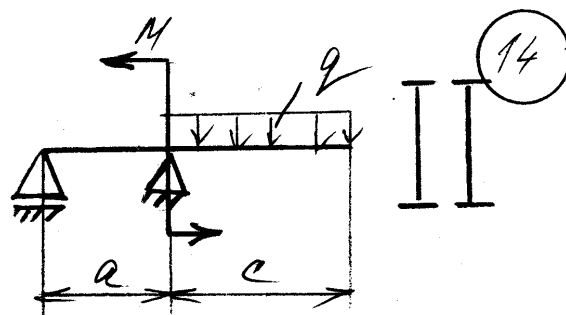
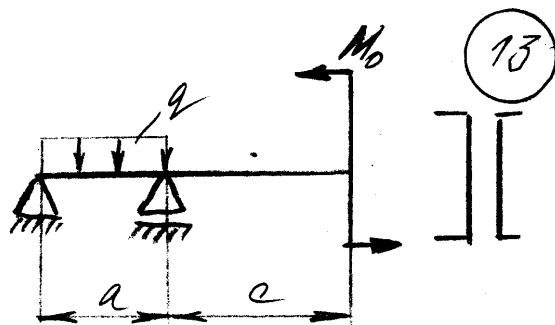
$q = 10 \text{ kH/M}; F = 18 \text{ kH}; M_0 = 16 \text{ kHM}$
 $a = 2,1 \text{ M}; c = 1,6 \text{ M}$

$q = 22 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 28 \text{ kHM}$
 $a = 2,3 \text{ M}; c = 1,6 \text{ M}$



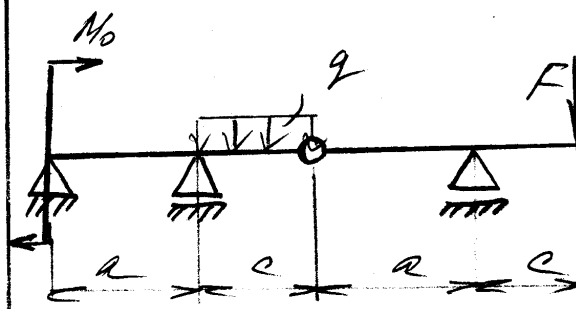
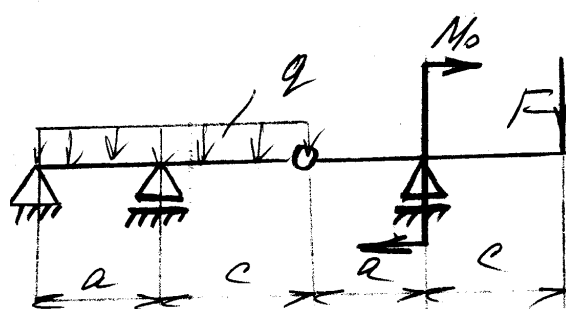
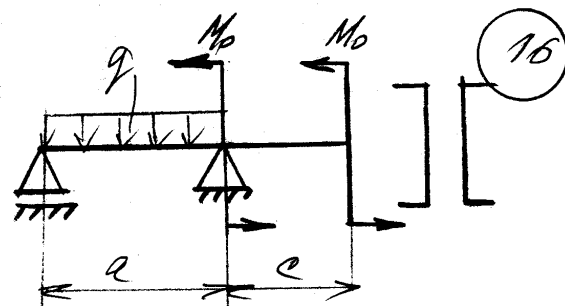
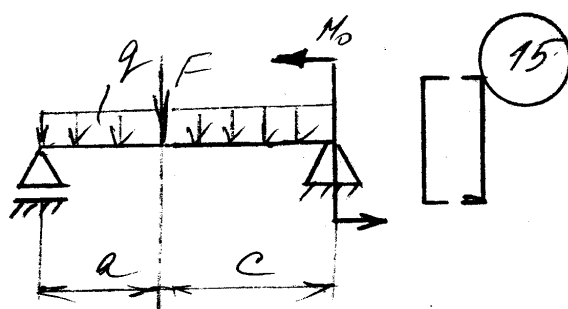
$q = 4 \text{ kH/M}; F = 18 \text{ kH}; M_0 = 16 \text{ kHM}$
 $a = 1,6 \text{ M}; c = 2,2 \text{ M}$

$q = 14 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 20 \text{ kHM}$
 $a = 2,2 \text{ M}; c = 1,7 \text{ M}$



$q = 20 \text{ kH/M}; F = 14 \text{ kH}; M_0 = 28 \text{ kHM};$
 $a = 1.5 \text{ M}; c = 2.0 \text{ M}$

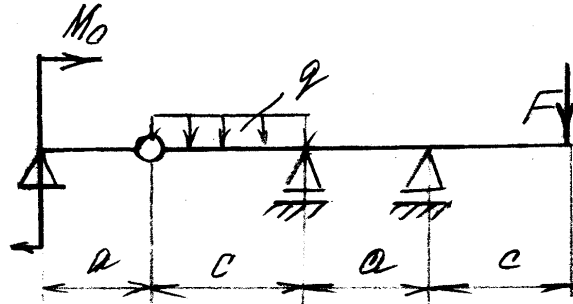
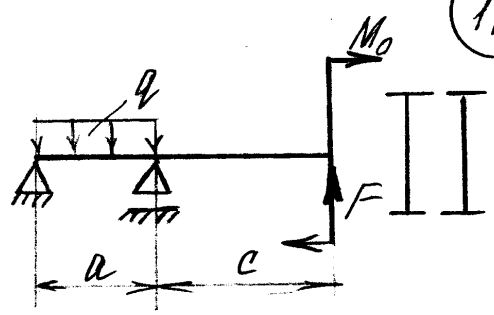
$q = 6 \text{ kH/M}; F = 18 \text{ kH}; M_0 = 10 \text{ kHM};$
 $a = 1.4 \text{ M}; c = 2.0 \text{ M}$



$q = 10 \text{ kH/M}; F = 18 \text{ kH}; M_0 = 10 \text{ kHM};$
 $a = 1.6 \text{ M}; c = 2.4 \text{ M}$

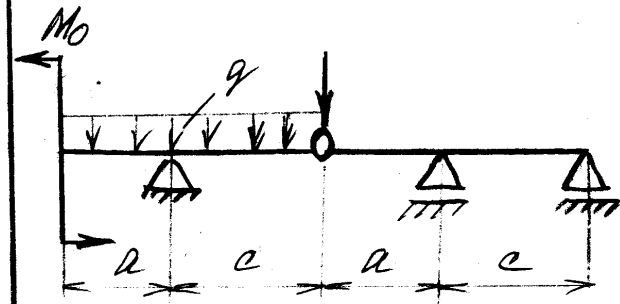
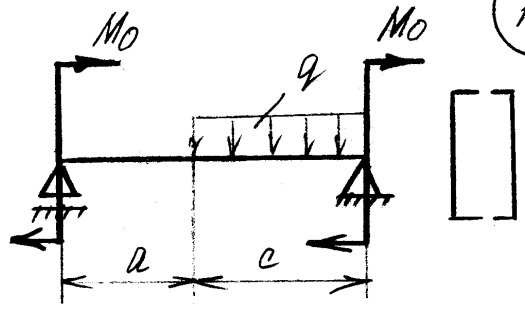
$q = 18 \text{ kH/M}; F = 12 \text{ kH}; M_0 = 20 \text{ kHM};$
 $a = 2 \text{ M}; c = 1.9 \text{ M}$

17



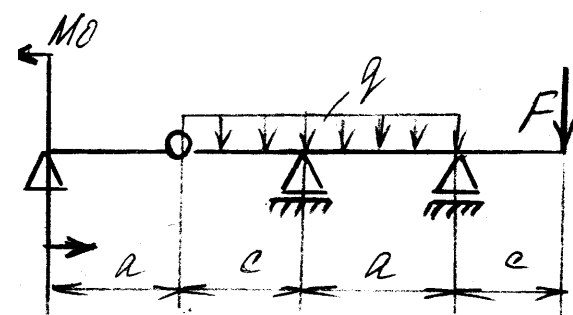
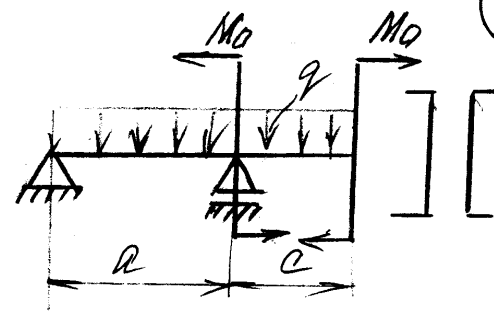
$q = 14 \frac{\text{KH}}{\text{M}}; F = 12 \text{ KH}; M_0 = 26 \text{ KHM};$
 $a = 1,4 \text{ M}; c = 2,0 \text{ M}.$

18



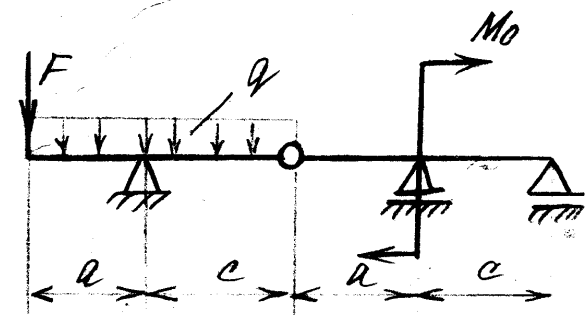
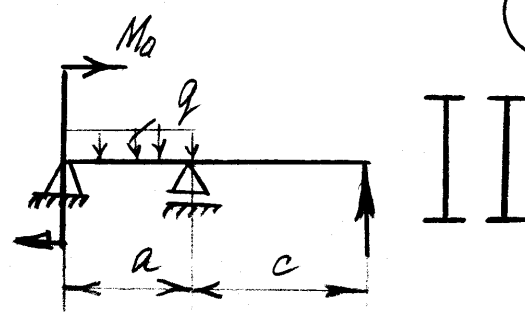
$q = 12 \frac{\text{KH}}{\text{M}}; F = 24 \text{ KH}; M_0 = 20 \text{ KHM};$
 $a = 1,6 \text{ M}; c = 2,4 \text{ M}$

19

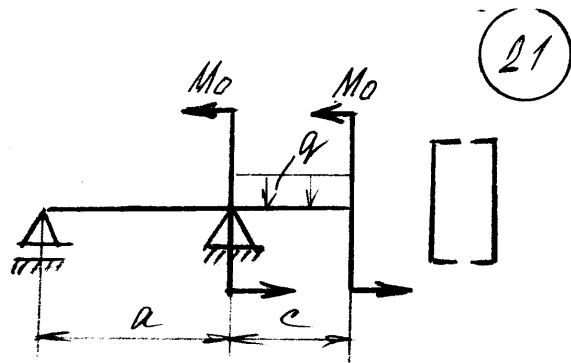


$q = 20 \frac{\text{KH}}{\text{M}}; F = 14 \text{ KH}; M_0 = 16 \text{ KHM};$
 $a = 2,4 \text{ M}; c = 1,6 \text{ M}$

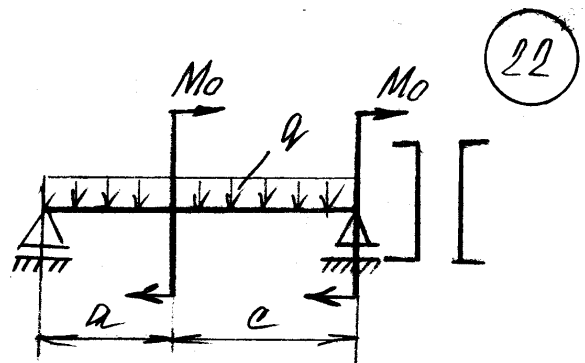
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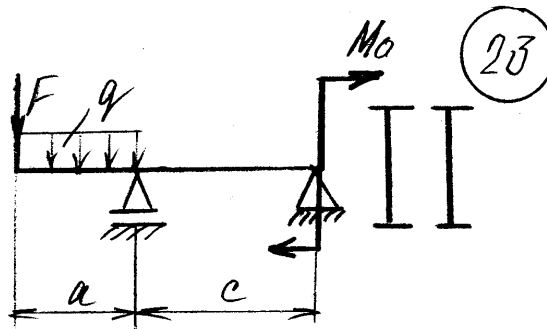
$q = 16 \frac{\text{KH}}{\text{M}}; F = 26 \text{ KH}; M_0 = 24 \text{ KHM};$
 $a = 2,1 \text{ M}; c = 1,6 \text{ M}$



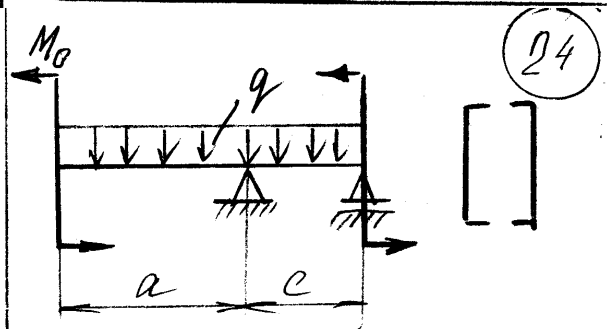
$q = 18 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 22 \text{ kHm}$
 $a = 1,4 \text{ M}; c = 2,2 \text{ M}$



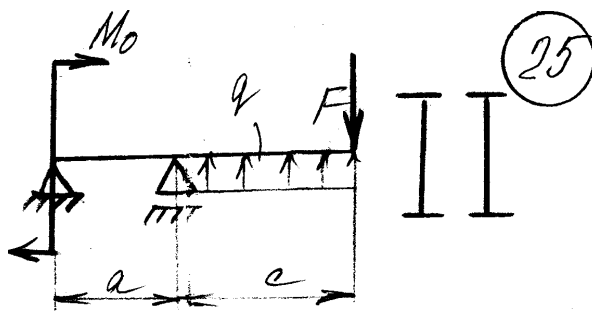
$q = 10 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 20 \text{ kHm}$
 $a = 1,4 \text{ M}; c = 2 \text{ M}$



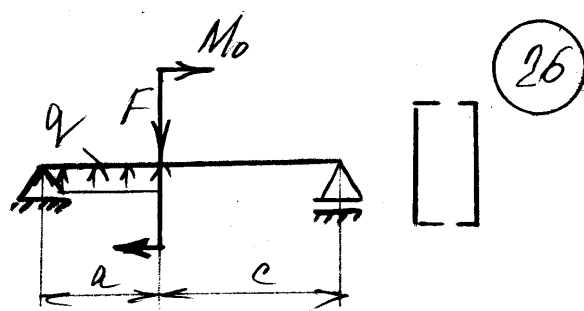
$q = 6 \text{ kH/M}; F = 10 \text{ kH}; M_0 = 22 \text{ kHm}$
 $a = 1,6 \text{ M}; c = 1,8 \text{ M}$



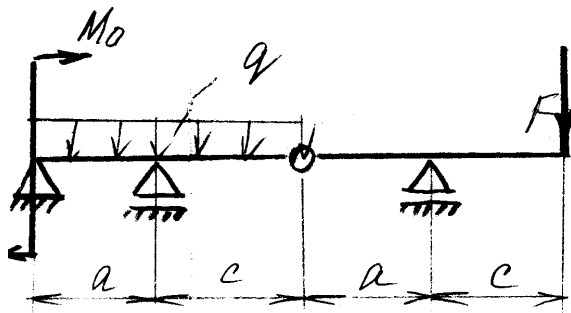
$q = 8 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 14 \text{ kHm}$
 $a = 2,2 \text{ M}; c = 1,6 \text{ M}$



25

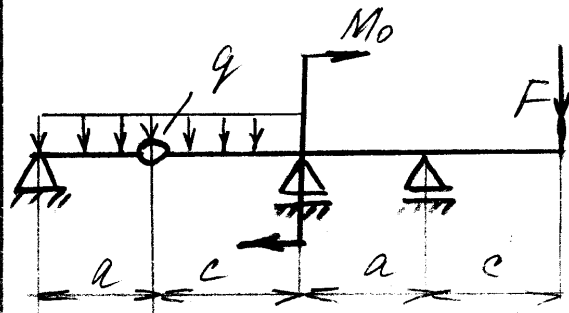


26



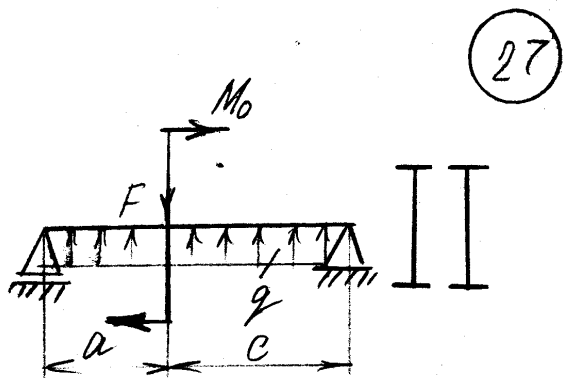
$$q = 12 \text{ kH/M}; F = 10 \text{ kH}; M_0 = 14 \text{ kHM}$$

$$a = 2 \text{ M}; c = 2,2 \text{ M}$$

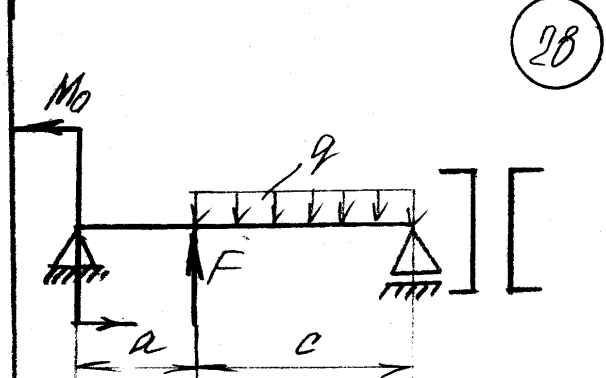


$$q = 10 \text{ kH/M}; F = 12 \text{ kH}; M_0 = 16 \text{ kHM}$$

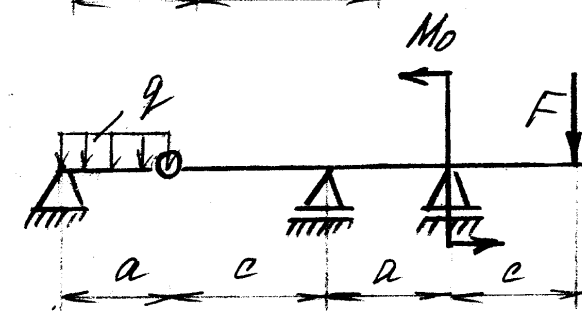
$$a = 1,4 \text{ M}; c = 2,2 \text{ M}$$



27

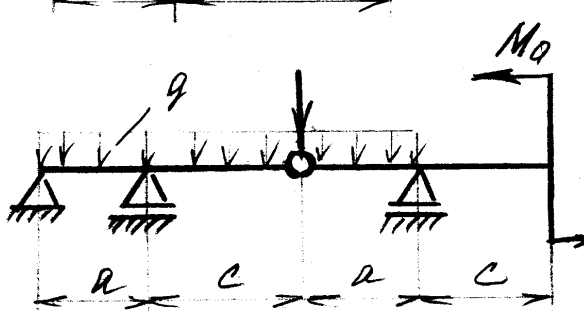


28



$$q = 20 \text{ kH/M}; F = 12 \text{ kH}; M_0 = 10 \text{ kHM}$$

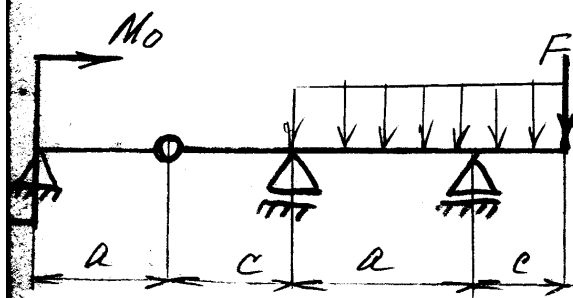
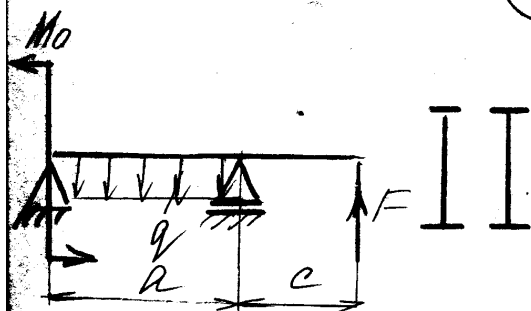
$$a = 1,2 \text{ M}; c = 2,4 \text{ M}$$



$$q = 12 \text{ kH/M}; F = 16 \text{ kH}; M_0 = 20 \text{ kHM}$$

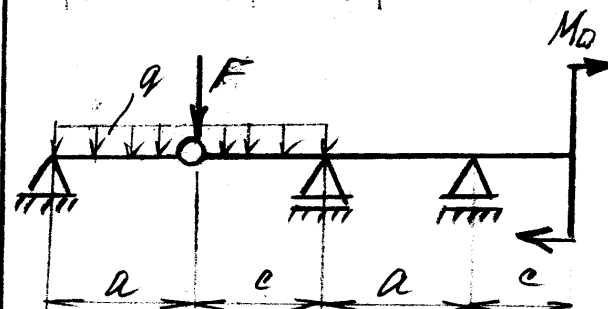
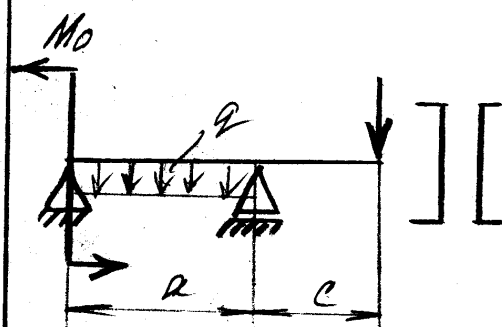
$$a = 1,6 \text{ M}; c = 2,2 \text{ M}$$

29



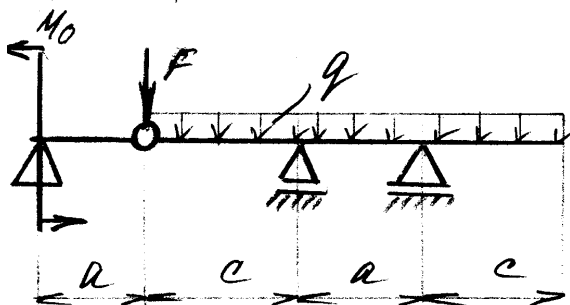
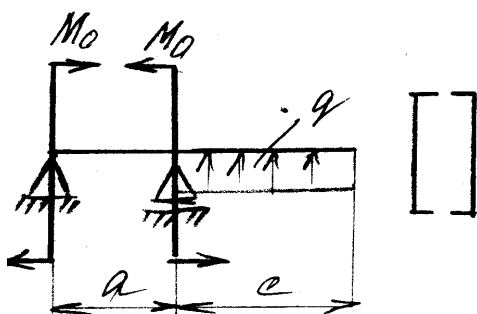
$q = 16 \text{ kH/M}; F = 20 \text{ kHM}; M_0 = 18 \text{ kHM};$
 $a = 2 \text{ M}; c = 3.4 \text{ M}$

30



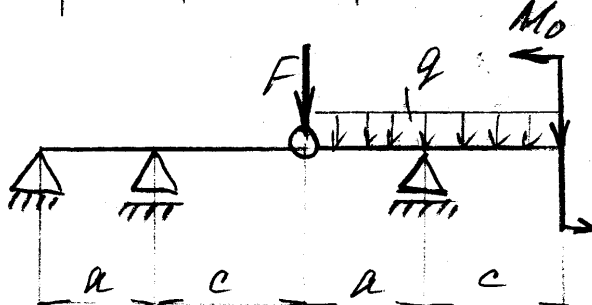
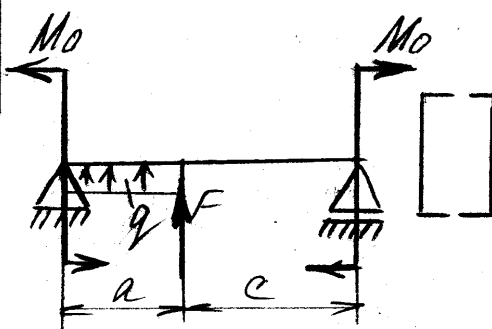
$q = 18 \text{ kH/M}; F = 22 \text{ kH}; M_0 = 24 \text{ kHM};$
 $a = 1.7 \text{ M}; c = 1.5 \text{ M}$

31



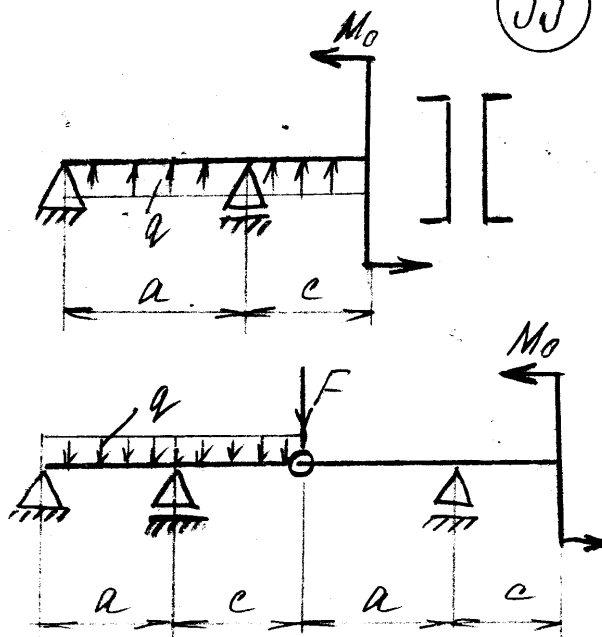
$q = 20 \text{ kH}; F = 18 \text{ kH}; M_0 = 12 \text{ kHM};$
 $a = 1.4 \text{ M}; c = 1.8 \text{ M}$

32



$q = 20 \text{ kH/M}; F = 10 \text{ kH}; M_0 = 14 \text{ kHM};$
 $a = 2.2 \text{ M}; c = 1.4 \text{ M}$

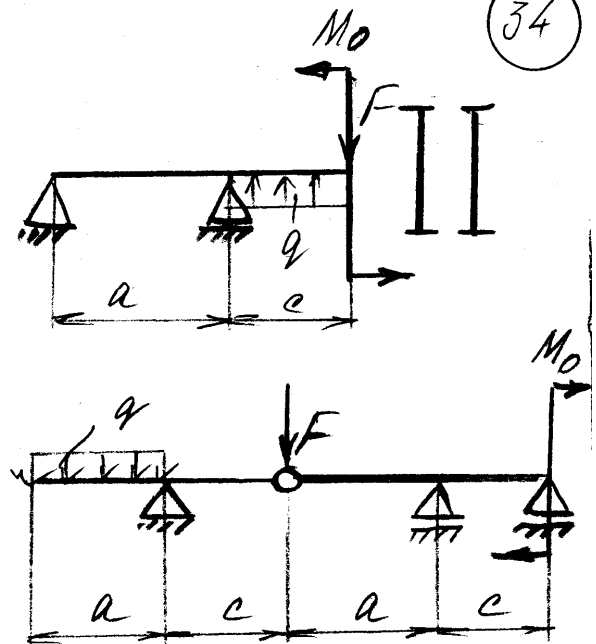
33



$$q = 24 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 16 \text{ kHM};$$

$$a = 2,0 \text{ M}; c = 1,6 \text{ M}$$

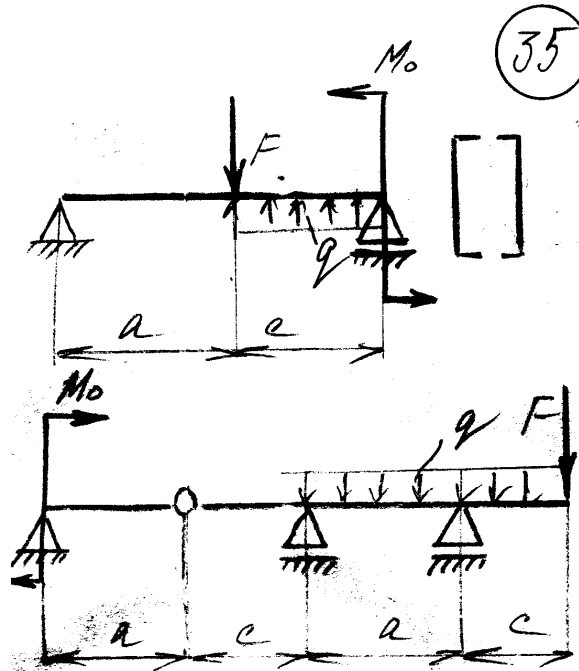
34



$$q = 26 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 12 \text{ kHM};$$

$$a = 2,2 \text{ M}; c = 1,4 \text{ M}$$

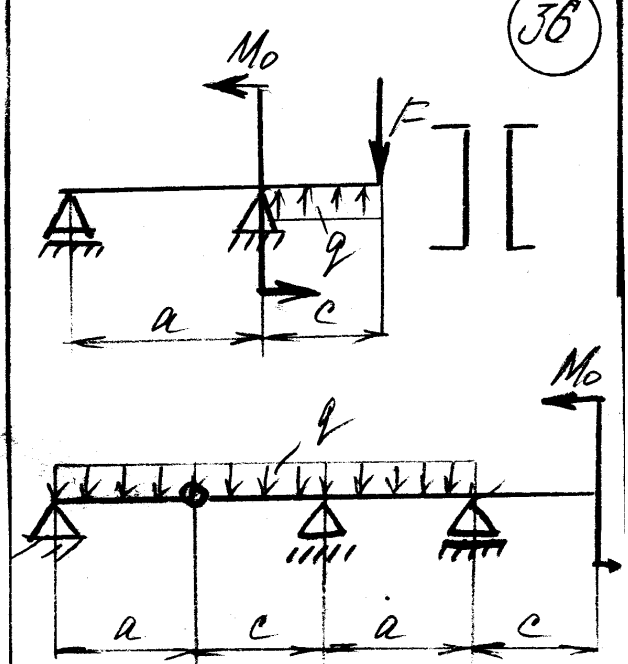
35



$$q = 12 \text{ kH/M}; F = 25 \text{ kH}; M_0 = 14 \text{ kHM};$$

$$a = 2,4 \text{ M}; c = 1,8 \text{ M}$$

36



$$q = 14 \text{ kH/M}; F = 20 \text{ kH}; M_0 = 22 \text{ kHM};$$

$$a = 1,4 \text{ M}; c = 1,8 \text{ M}$$