***Задача 1. Построение эпюр продольных усилий и перемещений при растяжении –сжатии стержня переменного поперечного сечения при действии распределенной нагрузки.***

Для вертикального стержня, имеющего жесткую заделку на одном из концов, изображенного на рис.1 необходимо:

1) Вычертить схему в произвольном масштабе.

2) Определить значения нормальной силы на каждом участке стержня.

3) Построить эпюру нормальной силы.

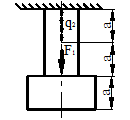
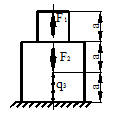
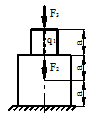
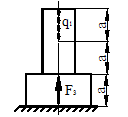
4) Определить удлинение стержня.

Длины участков стержня и нагрузки, приложенные к нему, приведены в табл.1, площадь поперечного сечения узкого участка *А* = 0,2 м2, широкого участка 2*А*.

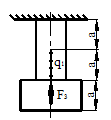
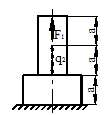
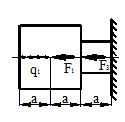
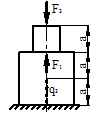
Таблица 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Номер  cтроки | Схема  по рис.1 | а,  м | q1=q3,  кН/м | q2,  кН/м | F1,  кН | F2,  кН | F3,  кН |
| 01 | 1 | 0,8 | 5 | 30 | 10 | 35 | 10 |
| 02 | 2 | 1 | 10 | 25 | 15 | 30 | 20 |
| 03 | 3 | 1,2 | 15 | 20 | 20 | 25 | 30 |
| 04 | 4 | 1,4 | 20 | 15 | 25 | 20 | 40 |
| 05 | 5 | 1,6 | 25 | 10 | 30 | 15 | 10 |
| 06 | 6 | 1,8 | 30 | 5 | 35 | 10 | 20 |
| 07 | 7 | 2 | 5 | 30 | 40 | 5 | 30 |
| 08 | 8 | 0,8 | 10 | 25 | 10 | 35 | 40 |
| 09 | 9 | 1 | 15 | 20 | 15 | 30 | 10 |
| 10 | 10 | 1,2 | 20 | 15 | 20 | 25 | 20 |
| 11 | 11 | 1,4 | 10 | 25 | 20 | 30 | 30 |
| 12 | 12 | 1,6 | 15 | 20 | 25 | 25 | 40 |
| 13 | 13 | 1,8 | 20 | 15 | 30 | 20 | 10 |
| 14 | 14 | 2 | 25 | 10 | 35 | 15 | 20 |
| 15 | 15 | 0,8 | 30 | 5 | 40 | 10 | 30 |
| 16 | 16 | 1 | 5 | 30 | 10 | 5 | 40 |
| 17 | 17 | 1,8 | 20 | 25 | 15 | 35 | 10 |
| 18 | 18 | 2 | 25 | 25 | 25 | 30 | 20 |
| 19 | 19 | 0,8 | 30 | 20 | 30 | 20 | 40 |
| 20 | 20 | 1 | 5 | 15 | 35 | 15 | 10 |
| 21 | 21 | 1,2 | 10 | 10 | 40 | 10 | 20 |
| 22 | 22 | 1,4 | 15 | 5 | 10 | 5 | 30 |
| 23 | 23 | 1,6 | 20 | 30 | 15 | 35 | 40 |
| 24 | 24 | 1,8 | 10 | 25 | 20 | 30 | 10 |
| 25 | 25 | 2 | 15 | 20 | 20 | 25 | 20 |
| 26 | 26 | 0,8 | 20 | 15 | 25 | 30 | 30 |
| 27 | 27 | 1 | 25 | 25 | 40 | 25 | 40 |
| 28 | 28 | 1,8 | 30 | 20 | 10 | 20 | 10 |
| 29 | 29 | 2 | 5 | 15 | 15 | 15 | 20 |
| 30 | 30 | 0,8 | 20 | 10 | 25 | 10 | 30 |
| 31 | 31 | 1 | 10 | 30 | 30 | 5 | 40 |
| 32 | 32 | 1,2 | 15 | 25 | 35 | 35 | 10 |
| 33 | 33 | 1,4 | 20 | 20 | 40 | 30 | 20 |
| 34 | 34 | 1,6 | 25 | 15 | 10 | 25 | 10 |
| 35 | 35 | 1 | 30 | 25 | 15 | 30 | 20 |
| 36 | 36 | 1,2 | 15 | 20 | 25 | 25 | 30 |
|  | б | г | а | в | б | а | г |

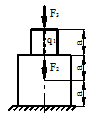
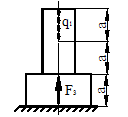
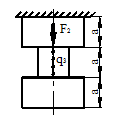
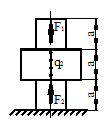
**1 схема**           **2 схема**            **3 схема**       **4 схема**



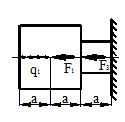
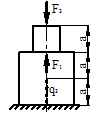
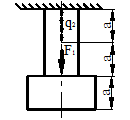
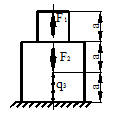
**5 схема**           **6 схема**            **7 схема**       **8 схема**



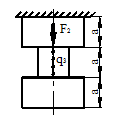
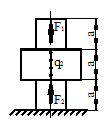
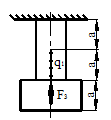
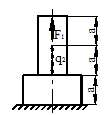
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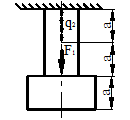
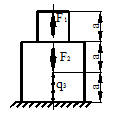
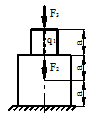
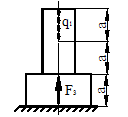
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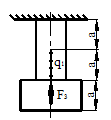
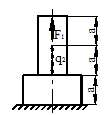
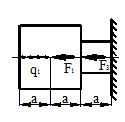
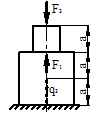
**17 схема**           **18 схема**            **19 схема**       **20 схема**



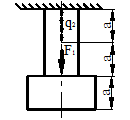
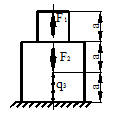
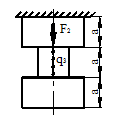
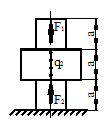
**21 схема**          **22 схема**        **23 схема**       **24 схема**



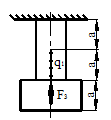
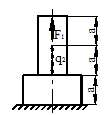
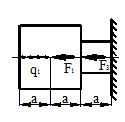
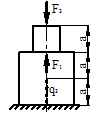
**25 схема**           **26 схема**            **27 схема**       **28 схема**



**29 схема**           **30 схема**            **31 схема**       **32 схема**



**33 схема**           **34 схема**            **35 схема**       **36 схема**



**Рис.1**

***Задача 2. Расчет сложных составных несимметричных поперечных сечений.***

Для сечения, изображенного на рис.1 требуется:

1) вычертить сечение в масштабе и показать основные размеры в числах.

2) определить положение центра тяжести и указать положение главных центральных осей.

3) вычислить величину главных моментов инерции и моментов сопротивления сечения.

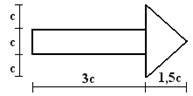
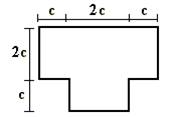
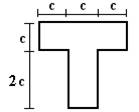
4) определить главные радиусы инерции сечения.

При расчете все необходимые данные следует взять из таблицы 1.

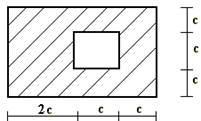
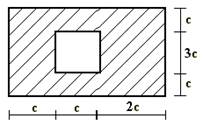
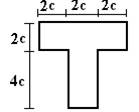
Таблица 1

|  |  |  |
| --- | --- | --- |
| Номер  строки | Схема сечения  по рис.1 | с,  м |
| 01 | 1 | 0,1 |
| 02 | 2 | 0,15 |
| 03 | 3 | 0,2 |
| 04 | 4 | 0,25 |
| 05 | 5 | 0,3 |
| 06 | 6 | 0,1 |
| 07 | 7 | 0,15 |
| 08 | 8 | 0,2 |
| 09 | 9 | 0,25 |
| 10 | 10 | 0,3 |
| 11 | 11 | 0,2 |
| 12 | 12 | 0,25 |
| 13 | 13 | 0,3 |
| 14 | 14 | 0,1 |
| 15 | 15 | 0,15 |
| 16 | 16 | 0,1 |
| 17 | 17 | 0,15 |
| 18 | 18 | 0,2 |
| 19 | 19 | 0,25 |
| 20 | 20 | 0,3 |
| 21 | 21 | 0,1 |
| 22 | 22 | 0,15 |
| 23 | 23 | 0,2 |
| 24 | 24 | 0,25 |
| 25 | 25 | 0,3 |
| 26 | 26 | 0,2 |
| 27 | 27 | 0,25 |
| 28 | 28 | 0,3 |
| 29 | 29 | 0,25 |
| 30 | 30 | 0,3 |
| 31 | 31 | 0,1 |
| 32 | 32 | 0,15 |
| 33 | 33 | 0,2 |
| 34 | 34 | 0,25 |
| 35 | 35 | 0,3 |
| 36 | 36 | 0,2 |
|  | в | б |

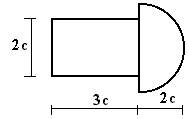
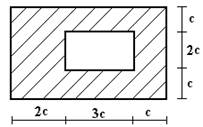
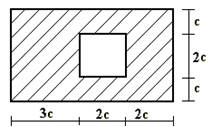
**1 схема**              **2 схема                                  3 схема**



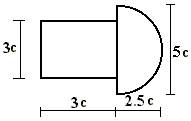
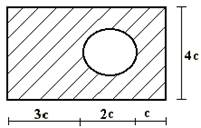
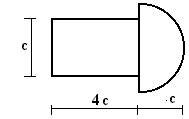
**4 схема**              **5 схема                                  6 схема**



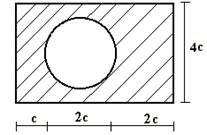
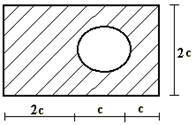
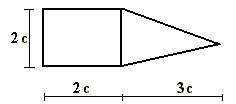
**7 схема**              **8 схема                                  9 схема**



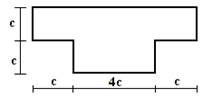
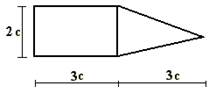
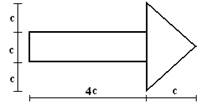
**10 схема**              **11 схема                                  12 схема**



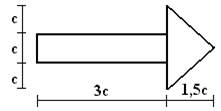
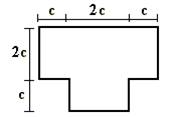
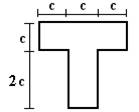
**13 схема**              **14 схема                                  15 схема**



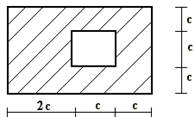
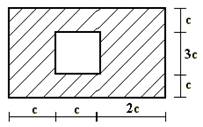
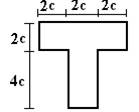
**16 схема**              **17 схема                                        18 схема**



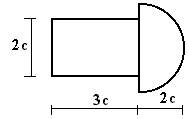
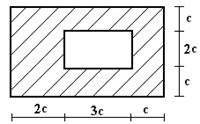
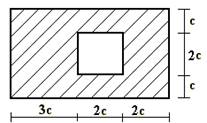
**19 схема**              **20 схема                                  21 схема**



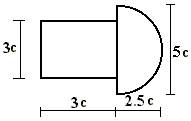
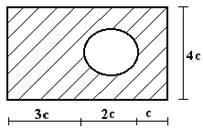
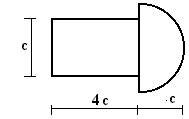
**22 схема**              **23 схема                                  24 схема**



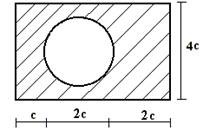
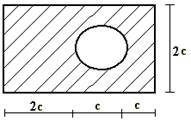
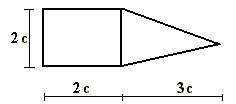
**25 схема**              **26 схема                                  27 схема**



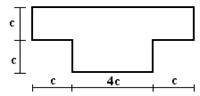
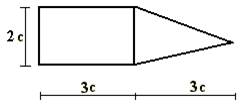
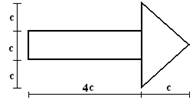
**28 схема**              **29 схема                                  30 схема**



**31 схема**              **32 схема                                  33 схема**



**34 схема**              **35 схема                                        36 схема**



**Рис.1**

***Задача 3. Подбор сечений консольных и двухопорных балок, работающих на поперечный изгиб***

Для балок, изображенных на схемах 1 – 5 (рис.1), требуется:

1) простроить эпюры внутренних усилий;

2) указать положение опасного сечения.

3) для деревянной балки, изображенной на схеме 1, подобрать размеры квадратного поперечного сечения из условия прочности, если [σ] = 16 МПа;

4) для стальной двутавровой балки, изображенной на схеме 2, подобрать номер прокатного профиля из условия прочности.

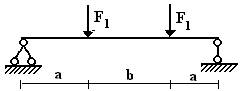
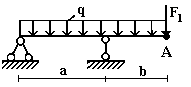
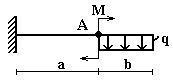
Данные для схем 1 – 5 взять из табл.1.

Таблица 1

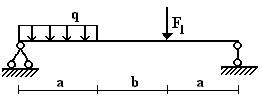
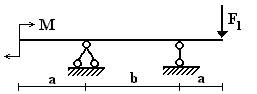
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Номер  cтроки | Схема  по рис.1 | F1,  см2 | а,  м | b,  м | М,  кНм | q,  кН/м |
| 01 | 1 | 12 | 1 | 2 | 24 | 5 |
| 02 | 2 | 10 | 2 | 2 | 16 | 4 |
| 03 | 3 | 12 | 3 | 2 | 12 | 6 |
| 04 | 4 | 6 | 2 | 3 | 18 | 2 |
| 05 | 5 | 8 | 1 | 3 | 20 | 4 |
| 06 | 6 | 10 | 3 | 1 | 12 | 2 |
| 07 | 7 | 6 | 2 | 2 | 12 | 3 |
| 08 | 8 | 8 | 1 | 2 | 12 | 6 |
| 09 | 9 | 6 | 2 | 1 | 16 | 5 |
| 10 | 10 | 12 | 1 | 3 | 10 | 6 |
| 11 | 11 | 11 | 1 | 2 | 12 | 6 |
| 12 | 12 | 12 | 3 | 3 | 18 | 2 |
| 13 | 13 | 10 | 2 | 3 | 20 | 4 |
| 14 | 14 | 12 | 1 | 1 | 12 | 2 |
| 15 | 15 | 6 | 2 | 2 | 12 | 3 |
| 16 | 16 | 8 | 1 | 2 | 12 | 6 |
| 17 | 17 | 10 | 2 | 1 | 18 | 5 |
| 18 | 18 | 6 | 3 | 2 | 20 | 6 |
| 19 | 19 | 8 | 2 | 2 | 12 | 2 |
| 20 | 20 | 6 | 1 | 3 | 12 | 4 |
| 21 | 21 | 12 | 3 | 3 | 12 | 2 |
| 22 | 22 | 12 | 2 | 1 | 16 | 3 |
| 23 | 23 | 13 | 1 | 2 | 10 | 6 |
| 24 | 24 | 14 | 1 | 2 | 12 | 5 |
| 25 | 25 | 12 | 3 | 1 | 18 | 6 |
| 26 | 26 | 10 | 2 | 3 | 20 | 6 |
| 27 | 27 | 12 | 1 | 2 | 12 | 2 |
| 28 | 28 | 6 | 2 | 3 | 24 | 4 |
| 29 | 29 | 8 | 1 | 3 | 16 | 2 |
| 30 | 30 | 10 | 2 | 1 | 12 | 3 |
| 31 | 31 | 6 | 3 | 2 | 18 | 6 |
| 32 | 32 | 8 | 2 | 2 | 20 | 5 |
| 33 | 33 | 6 | 1 | 1 | 12 | 6 |
| 34 | 34 | 12 | 3 | 3 | 12 | 2 |
| 35 | 35 | 11 | 2 | 2 | 16 | 4 |
| 36 | 36 | 12 | 3 | 3 | 12 | 2 |
|  | а | г | в | б | г | а |

**Вариант 1.**

**1 схема**                             **2 схема                                          3 схема**

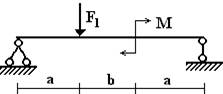
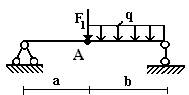
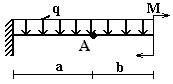


**4 схема**                                             **5 схема**

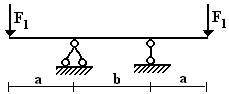
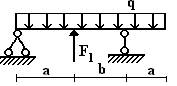


**Вариант 2.**

**1 схема**                             **2 схема                                          3 схема**

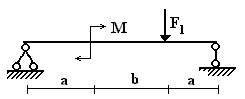
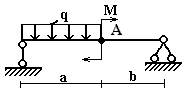
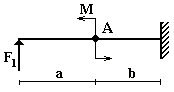


**4 схема**                                             **5 схема**

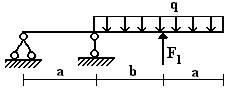
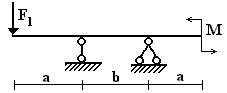
          

**Вариант 3.**

**1 схема**                             **2 схема                                          3 схема**

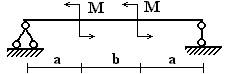
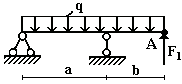
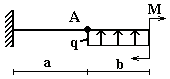


**4 схема**                                             **5 схема**

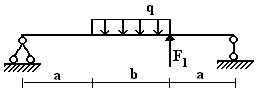
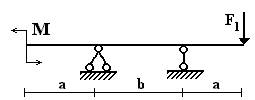


**Вариант 4.**

**1 схема**                             **2 схема                                          3 схема**

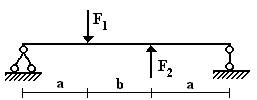
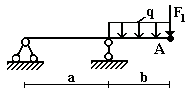
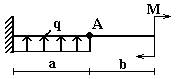


**4 схема**                                             **5 схема**

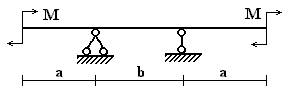
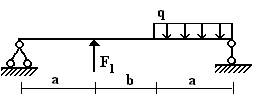


**Вариант 5.**

**1 схема**                             **2 схема                                          3 схема**

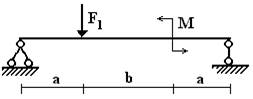
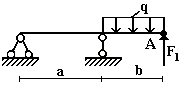
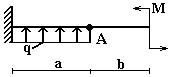


**4 схема**                                    **5 схема**

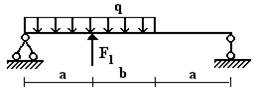
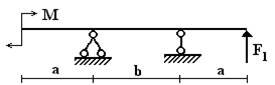
    

**Вариант 6.**

**1 схема**                             **2 схема                                          3 схема**

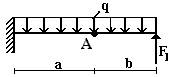
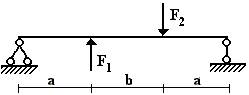
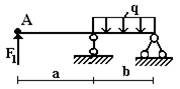


**4 схема**                                             **5 схема**

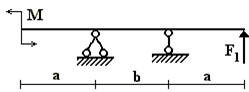
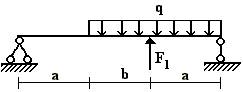


**Вариант 7.**

**1 схема**                             **2 схема                                          3 схема**

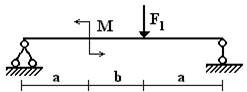
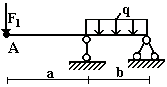
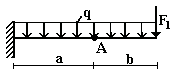
  

**4 схема**                                          **5 схема**

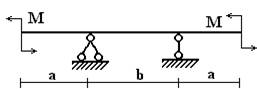
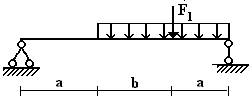
        

**Вариант 8.**

**1 схема**                             **2 схема                                          3 схема**

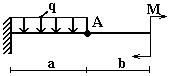
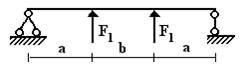
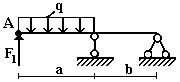


**4 схема**                                       **5 схема**

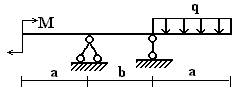
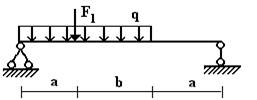
     

**Вариант 9.**

**1 схема**                             **2 схема                                          3 схема**

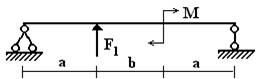
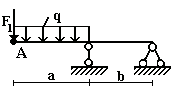
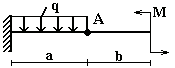
  

**4 схема**                                             **5 схема**

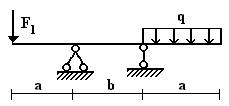
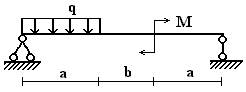
         

**Вариант 10.**

**1 схема**                             **2 схема                                          3 схема**

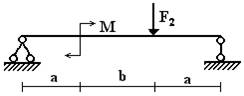
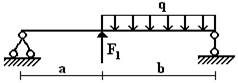
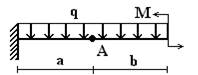


**4 схема**                                             **5 схема**

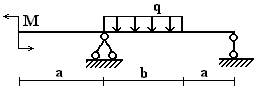
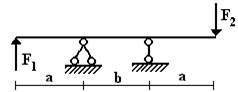
     

**Вариант 11.**

**1 схема**                                          **2 схема                                             3 схема**

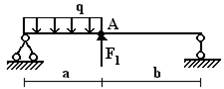
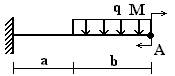
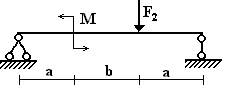


**4 схема**                                             **5 схема**

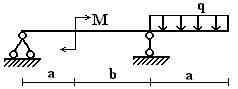
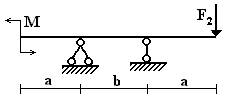


**Вариант 12.**

**1 схема**                             **2 схема                                          3 схема**

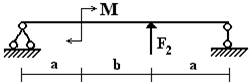
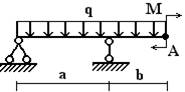
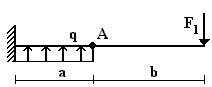
  

**4 схема**                                             **5 схема**

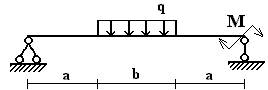
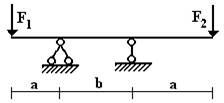


**Вариант 13.**

**1 схема**                             **2 схема                                          3 схема**

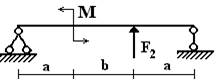
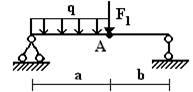
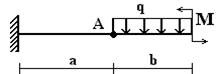


**4 схема**                                             **5 схема**

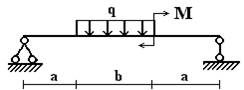
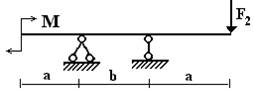


**Вариант 14.**

**1 схема**                             **2 схема                                          3 схема**

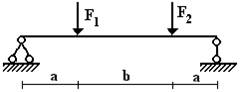
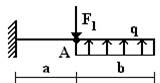


**4 схема**                                  **5 схема**

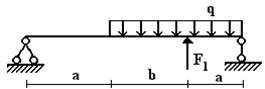
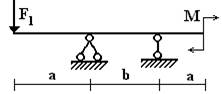


**Вариант 15.**

**1 схема**                             **2 схема                                          3 схема**

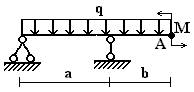
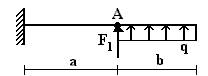


**4 схема**                                             **5 схема**

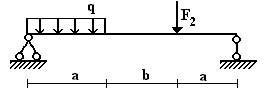
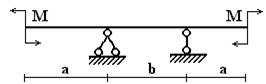


**Вариант 16.**

**1 схема**                             **2 схема                                          3 схема**

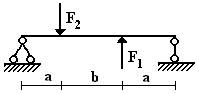
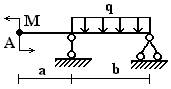
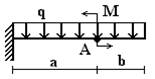


**4 схема**                                             **5 схема**

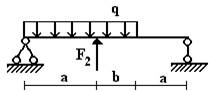
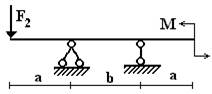


**Вариант 17.**

**1 схема**                             **2 схема                                          3 схема**

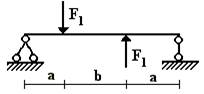
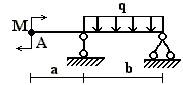
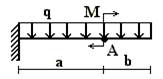


**4 схема**                     **5 схема**

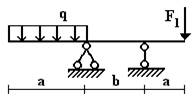
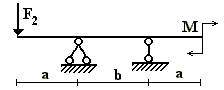


**Вариант 18.**

**1 схема**                             **2 схема                                          3 схема**

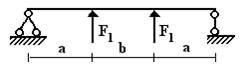
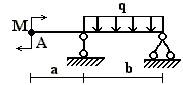
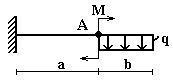


**4 схема**                     **5 схема**

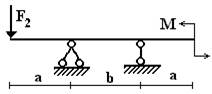
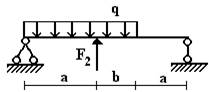


**Вариант 19.**

**1 схема**                             **2 схема                                          3 схема**

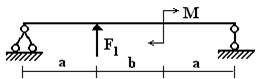
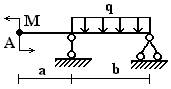
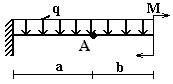


**4 схема**                                             **5 схема**

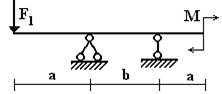
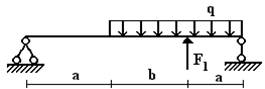
         

**Вариант 20.**

**1 схема**                             **2 схема                                          3 схема**

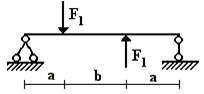
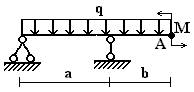
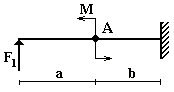


**4 схема**                                             **5 схема**

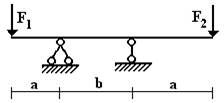
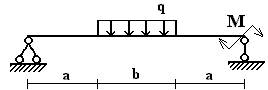
     

**Вариант 21.**

**1 схема**                             **2 схема                                          3 схема**

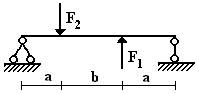
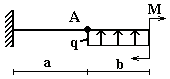


**4 схема**                                             **5 схема**

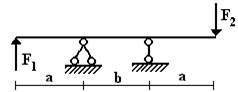
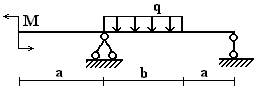
      

**Вариант 22.**

**1 схема**                             **2 схема                                          3 схема**

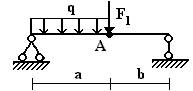
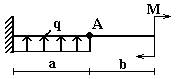


**4 схема**                                             **5 схема**

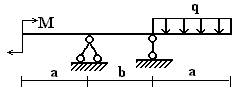
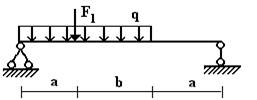
    

**Вариант 23.**

**1 схема**                             **2 схема                                          3 схема**

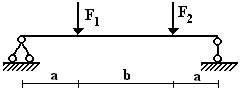
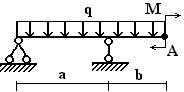
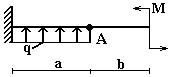
http://www.soprotmat.ru/kontrol22.files/image162.jpg

**4 схема**                                             **5 схема**

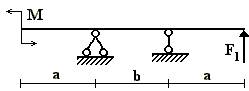
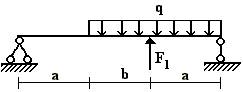
    

**Вариант 24.**

**1 схема**                             **2 схема                                          3 схема**

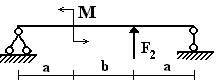
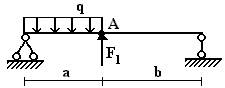
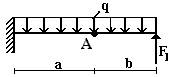


**4 схема**                                             **5 схема**

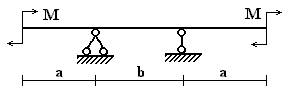
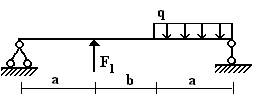
  

**Вариант 25.**

**1 схема**                             **2 схема                                          3 схема**

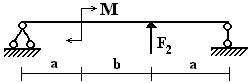
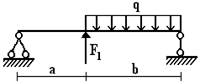
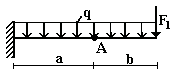


**4 схема**                                             **5 схема**

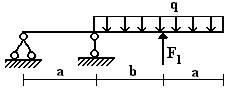
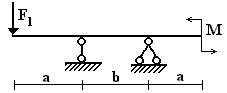
  

**Вариант 26.**

**1 схема**                             **2 схема                                          3 схема**

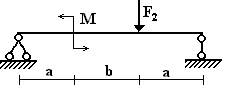
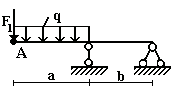
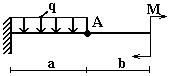


**4 схема**                                             **5 схема**

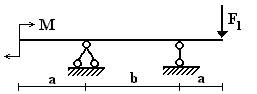
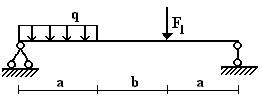


**Вариант 27.**

**1 схема**                             **2 схема                                          3 схема**

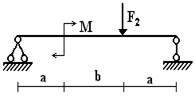
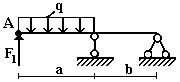
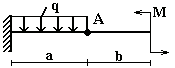


**4 схема**                                             **5 схема**

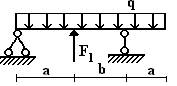
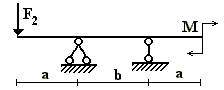
     

**Вариант 28.**

**1 схема**                             **2 схема                                          3 схема**

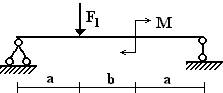
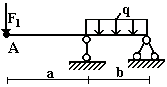
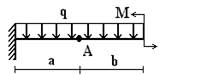


**4 схема**                                             **5 схема**

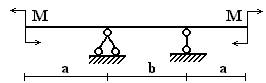
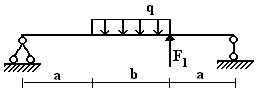


**Вариант 29.**

**1 схема**                             **2 схема                                          3 схема**

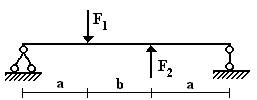
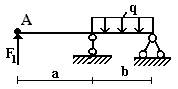
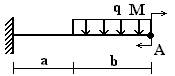


**4 схема**                                             **5 схема**

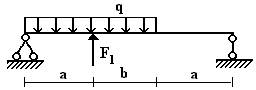
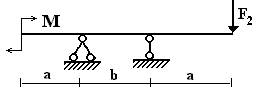
  

**Вариант 30.**

**1 схема**                             **2 схема                                          3 схема**

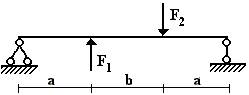
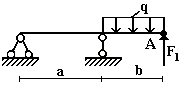
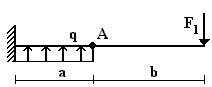


**4 схема**                                             **5 схема**

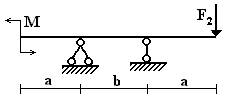
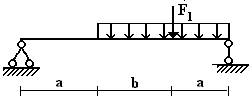


**Вариант 31.**

**1 схема**                             **2 схема                                          3 схема**

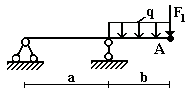
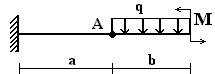


**4 схема**                                             **5 схема**

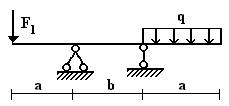
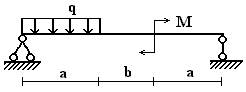
 

**Вариант 32.**

**1 схема**                             **2 схема                                          3 схема**

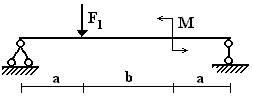
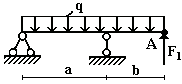
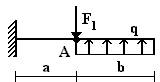


**4 схема**                                             **5 схема**

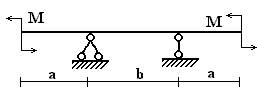
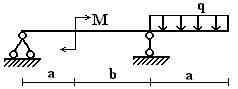
    

**Вариант 33.**

**1 схема**                             **2 схема                                          3 схема**

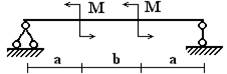
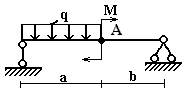
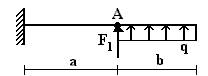


**4 схема**                                             **5 схема**

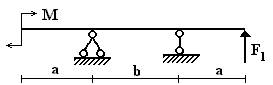
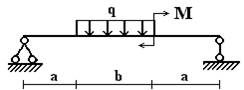
   

**Вариант 34.**

**1 схема**                             **2 схема                                          3 схема**

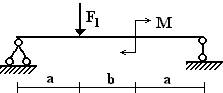
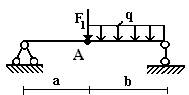
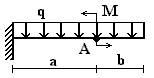


**4 схема**                                             **5 схема**

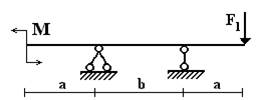
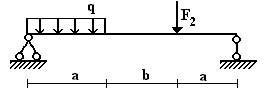
      

**Вариант 35.**

**1 схема**                             **2 схема                                          3 схема**

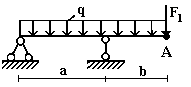
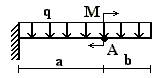


**4 схема**                                             **5 схема**

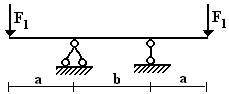
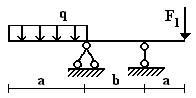
   

**Вариант 36.**

**1 схема**                             **2 схема                                          3 схема**



**4 схема**                                             **5 схема**

***Задача 4. Расчет статически определимого вала, работающего на кручение.***

К стальному валу приложены скручивающие моменты: *М*1*, М*2*, М*3*, М*4,(рис.1). Требуется:

1) построить эпюру крутящих моментов;

2) при заданном значении [τ] определить диаметр вала из расчета на прочность и округлить его величину до ближайшей большей, соответственно равной: 30, 35, 40,45, 50, 60, 70, 80, 90, 100 мм;

3) построить эпюру углов закручивания;

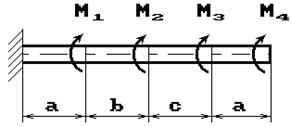
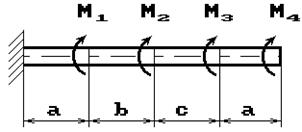
4) найти наибольший относительный угол закручивания.

Данные взять из табл.1.

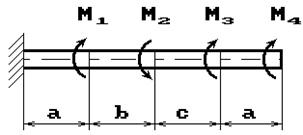
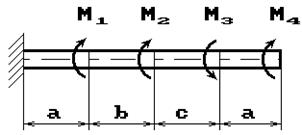
Таблица 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Номер  строки | Схема  по рис.1 | Расстояние, м | | | Моменты, кНм | | [τ],  МПа |
| *а* | *b* | *с* | *М*1;*М*3 | *М*2;*М*4 |
| 01 | 1 | 1,1 | 1,1 | 1,1 | 2,1 | 1,1 | 35 |
| 02 | 2 | 1,2 | 1,2 | 1,2 | 2,2 | 1,2 | 40 |
| 03 | 3 | 1,3 | 1,3 | 1,3 | 2,3 | 1,3 | 45 |
| 04 | 4 | 1,4 | 1,4 | 1,4 | 2,4 | 1,4 | 50 |
| 05 | 5 | 1,5 | 1,5 | 1,5 | 2,5 | 1,5 | 55 |
| 06 | 6 | 1,6 | 1,6 | 1,6 | 1,6 | 0,6 | 60 |
| 07 | 7 | 1,7 | 1,7 | 1,7 | 1,7 | 0,7 | 65 |
| 08 | 8 | 1,8 | 1,8 | 1,8 | 1,8 | 0,8 | 70 |
| 09 | 9 | 1,9 | 1,9 | 1,9 | 1,9 | 0,9 | 75 |
| 10 | 10 | 2,0 | 2,0 | 2,0 | 2,0 | 1,0 | 80 |
| 11 | 11 | 1,6 | 1,3 | 1,6 | 2,3 | 1,2 | 35 |
| 12 | 12 | 1,7 | 1,4 | 1,7 | 2,4 | 1,3 | 40 |
| 13 | 13 | 1,8 | 1,5 | 1,8 | 2,5 | 1,4 | 45 |
| 14 | 14 | 1,9 | 1,6 | 1,9 | 1,6 | 1,5 | 50 |
| 15 | 15 | 2,0 | 1,7 | 2,0 | 1,7 | 0,6 | 55 |
| 16 | 16 | 1,3 | 1,8 | 1,1 | 1,8 | 0,7 | 60 |
| 17 | 17 | 1,4 | 1,1 | 1,2 | 1,9 | 0,8 | 65 |
| 18 | 18 | 1,5 | 1,2 | 1,3 | 1,6 | 0,9 | 70 |
| 19 | 19 | 1,6 | 1,3 | 1,4 | 1,7 | 1,1 | 60 |
| 20 | 20 | 1,7 | 1,4 | 1,5 | 1,8 | 1,2 | 65 |
| 21 | 21 | 1,9 | 1,5 | 1,9 | 1,9 | 1,3 | 70 |
| 22 | 22 | 2,0 | 1,6 | 2,0 | 2,0 | 1,4 | 75 |
| 23 | 23 | 1,6 | 1,7 | 1,6 | 2,3 | 1,5 | 80 |
| 24 | 24 | 1,7 | 1,6 | 1,7 | 2,4 | 0,6 | 35 |
| 25 | 25 | 1,8 | 1,7 | 1,8 | 2,5 | 0,7 | 40 |
| 26 | 26 | 1,9 | 1,8 | 1,9 | 1,6 | 0,8 | 45 |
| 27 | 27 | 2,0 | 1,9 | 1,1 | 1,8 | 0,9 | 50 |
| 28 | 28 | 1,3 | 2,0 | 1,2 | 1,9 | 1,0 | 55 |
| 29 | 29 | 1,1 | 1,3 | 1,3 | 2,0 | 1,2 | 35 |
| 30 | 30 | 1,2 | 1,4 | 1,4 | 2,3 | 1,3 | 40 |
| 31 | 31 | 1,3 | 1,5 | 1,5 | 2,4 | 1,4 | 45 |
| 32 | 32 | 1,4 | 1,4 | 1,6 | 2,5 | 1,5 | 50 |
| 33 | 33 | 1,5 | 1,5 | 1,7 | 1,6 | 0,6 | 55 |
| 34 | 34 | 1,6 | 1,6 | 1,8 | 1,7 | 0,7 | 60 |
| 35 | 35 | 1,7 | 1,7 | 1,9 | 1,8 | 0,8 | 65 |
| 36 | 36 | 1,8 | 1,6 | 1,6 | 2,3 | 0,9 | 45 |
|  | б | а | в | г | а | б | в |

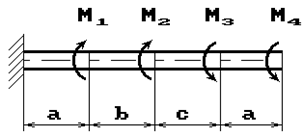
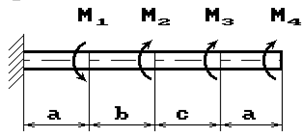
**1 схема**                                             **2 схема**



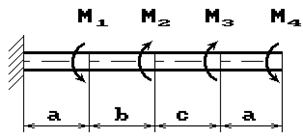
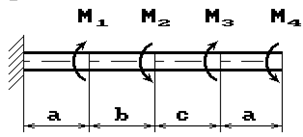
**3 схема**                                             **4 схема**



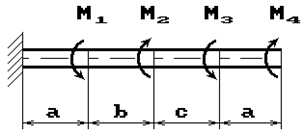
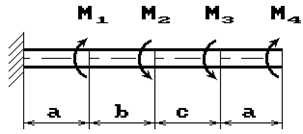
**5 схема**                                             **6 схема**



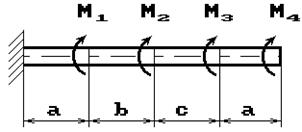
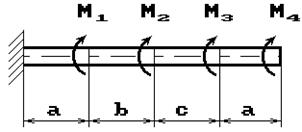
**7 схема**                                             **8 схема**



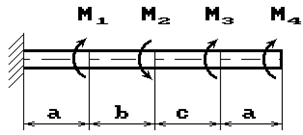
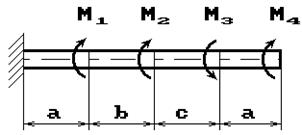
**9 схема**                                             **10 схема**



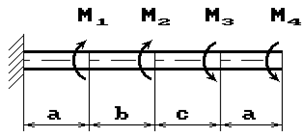
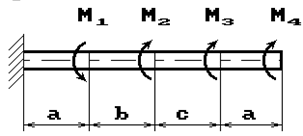
**11 схема**                                             **12 схема**



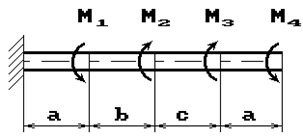
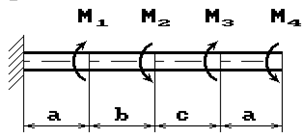
**13 схема**                                             **14 схема**



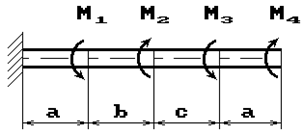
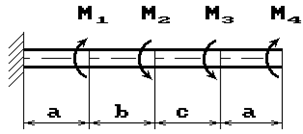
**15 схема**                                             **16 схема**



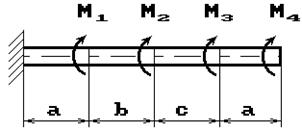
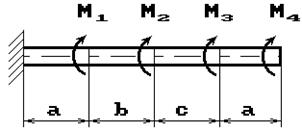
**17 схема**                                             **18 схема**



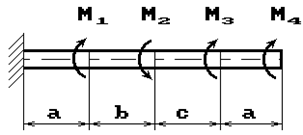
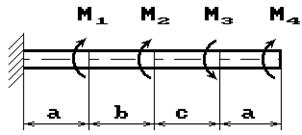
**19 схема**                                             **20 схема**



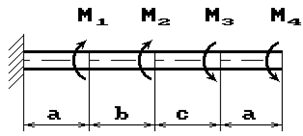
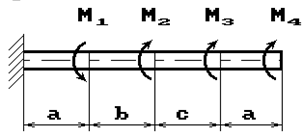
**21 схема**                                             **22 схема**



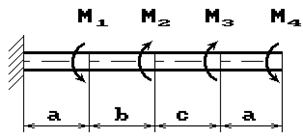
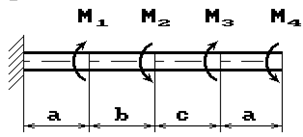
**23 схема**                                             **24 схема**



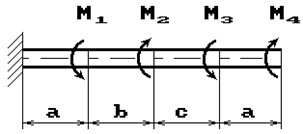
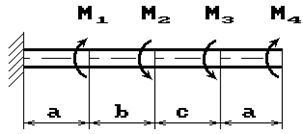
**25 схема**                                             **26 схема**



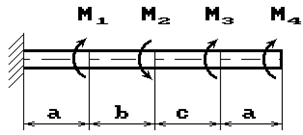
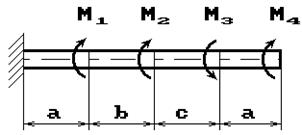
**27 схема**                                             **28 схема**



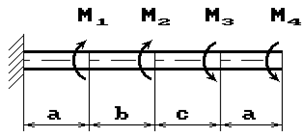
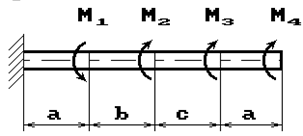
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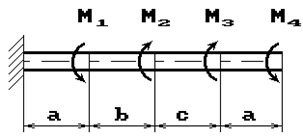
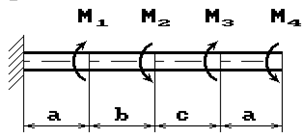
**31 схема**                                             **32 схема**



**33 схема**                                             **34 схема**



**35 схема**                                             **36 схема**



**Рис. 1**