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| ЗАДАНИЕ НА КУРСОВОЙ ПРОЕКТ |
|  |
| по дисциплине «Металлорежущие станки» |
|  | (наименование дисциплины) |
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| ТЕМА: | “Проектирование привода главного движения вертикально-фрезерного станка (аналог 6А54)“ |
| Исходные данные |  |
| Тип станка - вертикально-фрезерного (аналог 6А54) Тип привода - электрический, с односкоростным электродвигателемКоличество ступеней регулирования z = 18Компоновка привода - совмещенныйМаксимальный диаметр фрезы - 200 мм.Обрабатываемый материал - конструкционная сталь σв = 750 Н / мм2. |
| https://pp.userapi.com/c837634/v837634632/22de2/up9db8CbC58.jpg |
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Содержание

[1. ВВЕДЕНИЕ 5](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681916)

[2. РАСЧЕТ РЕЖИМОВ РЕЗАНИЯ 6](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681917)

[3. ТРЕБОВАНИЯ К ШПИНДЕЛЬНОМУ УЗЛУ И КОМПОНОВКА 8](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681918)

[4. КИНЕМАТИЧЕСКИЙ РАСЧЁТ ПРИВОДА ГЛАВНОГО ДВИЖЕНИЯ 9](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681919)

[4.1 Расчет знаменателя ряда 9](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681920)

[4.3 Разработка кинематической схемы привода 10](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681921)

[4.4 Выбор электродвигателя главного движения 11](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681922)

[4.5 Построение структурной сетки 11](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681923)

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[4.7 Определение чисел зубьев зубчатых колёс 14](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681925)

[5. ПРОЕКТИРОВАНИЕ КЛИНОРЕМЕННОЙ ПЕРЕДАЧИ 17](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681926)

[5.1 Исходные данные 17](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681927)

[5.2 Определение основных параметров передачи 17](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681928)

[5.2.1 Выбор сечения ремней 17](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681929)

[5.2.2 Геометрический расчет передачи 17](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681930)

[5.2.3 Силы, действующие на валы 19](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681931)

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[5.3.1 Размеры шкивов 19](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681933)

[5.3.2 Выбор способа установки на валах элементов открытых передач 22](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681934)

[6. СИЛОВОЙ РАСЧЕТ ЭЛЕМЕНТОВ ПРИВОДА 22](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681935)

[6.1 Определение расчётного крутящего момента 22](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681936)

[6.2 Построение графика мощности и момента 24](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681937)

[6.3 Расчёт зубчатых колёс 26](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681938)

[6.3.1 Выбор материала и термической обработки 26](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681939)

[6.3.2 Определение допускаемых напряжений 26](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681940)

[6.3.3 Расчетная нагрузка. Коэффициент нагрузки 27](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681941)

[6.3.4 Геометрические размеры передач 28](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681942)

[6.3.5 Проверочный расчет на контактную выносливость 31](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681943)

[6.3.6 Проверочный расчет на выносливость при изгибе 32](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681944)

[6.4 Расчет валов 34](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681945)

[6.4.1 Выбор материала валов 34](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681946)

[6.5 Выбор подшипников 36](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681947)

[6.5.1 Выбор типа и типоразмера подшипников для каждого вала привода 36](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681948)

[6.5.2 Выбор схемы установки подшипников, способа их крепления на валу и в корпусе 37](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681949)

[6.5.3 Проверка долговечности подшипников 37](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681950)

[6.5.4 Составление расчетных схем для валов и определение реакций в опорах, построение эпюр изгибающих и крутящих моментов 41](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681951)

[6.5.5 Проверка статической прочности валов 48](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681952)

[6.5.6 Проверка усталостной прочности валов 50](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681953)

[6.6 Конструирование зубчатых колес 52](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681954)

[6.7 Расчет шпоночных соединений 53](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681955)

[6.8 Расчёт шпиндельного узла коробки скоростей 55](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681956)

[6.8.1 Расчёт радиальной жёсткости шпиндельного узла 55](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681957)

[6.8.2 Расчет осевой жёсткости шпинделя 59](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681958)

[7. ВЫБОР СПОСОБА СМАЗКИ ДЛЯ ВСЕХ УЗЛОВ ПРИВОДА 61](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681959)

[7.1 Выбор системы смазки зубчатых колес 61](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681960)

[7.2 Выбор системы смазки подшипников 61](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681961)

[8. ЗАКЛЮЧЕНИЕ 62](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681962)

[СПИСОК ИСПОЛЬЗОВАННЫХ ИСТОЧНИКОВ 63](file:///C%3A%5CUsers%5Cboss%5CDesktop%5C%D0%A3%D1%87%D0%B5%D0%B1%D0%B0%5C%D0%90%D0%BD%D1%8F%5C4%20%D0%9A%D0%A3%D0%A0%D0%A1%5C7%20%D0%A1%D0%95%D0%9C%D0%95%D0%A1%D0%A2%D0%A0%5C%D0%9C%D0%A0%D0%A1%5C%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1%5C%D0%97%D0%B0%D0%BF%D0%B8%D1%81%D0%BA%D0%B0%20%D0%9A%D0%9F%20%D0%9C%D0%A0%D0%A1.docx#_Toc470681963)

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