Вариант 04

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **м2. Указания к выбору вариантов задач контрольного задания.**  Номер варианта задач 3.1.1 C:\Users\admin\Desktop\COURSE104\img\delenie.gif 3.1.2 и 3.3.1 C:\Users\admin\Desktop\COURSE104\img\delenie.gif 3.3.3 соответствует последней цифре, а номер варианта задач 3.2.1 C:\Users\admin\Desktop\COURSE104\img\delenie.gif 3.2.3 и 3.4.1 C:\Users\admin\Desktop\COURSE104\img\delenie.gif 3.4.2 предпоследней цифре пароля. Все решения сопровождаются подробными пояснениями.  **3. Задачи контрольного задания**  **3.1 Проводниковые материалы**  ***Задача № 3.1.1***  Определить падение напряжения в линии электропередач длиной L при температуре То1 , То2 , То3 , если провод имеет сечение S и по нему течет ток I.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | № вар. | Материал | То1, С | То2, С | То3, С | L, км | S, мм2 | I, А | | 1 | Al | -50 | +20 | +50 | 50 | 10 | 80 | | 2 | Cu | -30 | 0 | +30 | 500 | 30 | 250 | | 3 | Cu | -30 | +25 | +50 | 500 | 25 | 200 | | 4 | Al | -40 | +10 | +60 | 200 | 10 | 80 | | 5 | Al | -50 | +20 | +50 | 200 | 5 | 40 | | 6 | Cu | -30 | 0 | +30 | 500 | 15 | 120 | | 7 | Cu | -30 | +25 | +50 | 200 | 7,5 | 60 | | 8 | Al | -40 | +20 | +60 | 200 | 10 | 80 | | 9 | Al | -50 | +25 | +60 | 100 | 2,5 | 20 | | 0 | Cu | -40 | 0 | +40 | 50 | 10 | 80 |   ***Задача № 3.1.2***  Определить длину проволоки для намотки проволочного резистора с номиналом R, и допустимой мощностью рассеяния P.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | № вар. | Материал | R, Ом | P, Вт | j, А/мм2 | C:\Users\admin\Desktop\COURSE104\img\ro.GIF 0, мкОм\* м | | 1 | Алюминий | 100 | 100 | 0,5 | 0,028 | | 2 | Х20Н80 | 2000 | 5 | 0,3 | 1,05 | | 3 | Х15Н60 | 2000 | 5 | 0,1 | 1,1 | | 4 | Медь | 200 | 100 | 1,3 | 0,0172 | | 5 | Х20Н80 | 100 | 100 | 1,5 | 1,05 | | 6 | Алюминий | 2000 | 5 | 0,75 | 0,028 | | 7 | Х20Н80 | 1000 | 10 | 0,8 | 1,05 | | 8 | Х15Н60 | 1000 | 10 | 0,1 | 1,1 | | 9 | Медь | 1000 | 10 | 0,01 | 0,0172 | | 0 | Алюминий | 200 | 100 | 0,6 | 0,028 |   **3.2 Полупроводниковые материалы**  ***Задача 3.2.1***  Определить концентрацию электронов и дырок в собственном и примесном полупроводнике, содержащем N атомов примеси при комнатной температуре.   |  |  |  |  | | --- | --- | --- | --- | | № вар. | Полупроводник материал | примесь | N, см-3 | | 1 | Si | сурьма | 1014 | | 2 | Ge | бор | 2 \* 1017 | | 3 | Si | фосфор | 1015 | | 4 | Ge | алюминий | 2 \* 1018 | | 5 | Si | бор | 2,5 \* 1015 | | 6 | Ge | Фосфор | 1018 | | 7 | Si | Алюминий | 1016 | | 8 | Ge | Сурьма | 4,5 \* 1020 | | 9 | Si | Бор | 3 \* 1015 | | 0 | Ge | Фосфор | 2 \* 1018 |   ***Задача 3.2.2***  Образец полупроводникового материала легирован примесью (см. предыдущую задачу). Определить удельную проводимость собственного и примесного полупроводника при заданной температуре Т.   |  |  | | --- | --- | | № вар. | То, К | | 1 | 290 | | 2 | 300 | | 3 | 310 | | 4 | 320 | | 5 | 330 | | 6 | 290 | | 7 | 300 | | 8 | 310 | | 9 | 320 | | 0 | 330 |   ***Задача 3.2.3***  Определить диффузионную длину движения неравновесных носителей заряда в полупроводниковом материале при заданной температуре То, если время их жизни C:\Users\admin\Desktop\COURSE104\img\tao.GIF .   |  |  |  |  | | --- | --- | --- | --- | | № вар. | Материал | То, К | C:\Users\admin\Desktop\COURSE104\img\tao.GIF , мкс | | 1 | Si - n типа | 290 | 100 | | 2 | Ge - n – типа | 300 | 50 | | 3 | Si - p – типа | 310 | 75 | | 4 | Ge - p – типа | 320 | 120 | | 5 | Si - n – типа | 330 | 200 | | 6 | Ge - n – типа | 290 | 250 | | 7 | Si - p – типа | 300 | 125 | | 8 | Ge - p – типа | 310 | 80 | | 9 | Si - n – типа | 320 | 175 | | 0 | Ge - n – типа | 330 | 50 |   **3. 3 Диэлектрические материалы**  ***Задача № 3.3.1***  Конденсаторная керамика при 20° С имеет проводимость C:\Users\admin\Desktop\COURSE104\img\ksi.GIF ° = 10-13 Сим/см. Какова проводимость C:\Users\admin\Desktop\COURSE104\img\ksi.GIF т при заданной температуре, если температурный коэффициент сопротивления C:\Users\admin\Desktop\COURSE104\img\alfa.GIF = 0,8?   |  |  | | --- | --- | | № варианта | Т° , С | | 1 | 25 | | 2 | 29 | | 3 | 32 | | 4 | 37 | | 5 | 43 | | 6 | 35 | | 7 | 40 | | 8 | 45 | | 9 | 50 | | 0 | 52 |   ***Задача № 3.3.2***  Определить пробивное напряжение Uпр между электродами конденсатора на рабочей частоте f, если температура, до которой нагревается в электрическом поле диэлектрический материал толщиной h конденсатора, не превышает Токр.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | № вар. | Материал | f, кГц | h, мм | Т, оС | tg C:\Users\admin\Desktop\COURSE104\img\sigma.gif | C:\Users\admin\Desktop\COURSE104\img\alfa.GIF tg C:\Users\admin\Desktop\COURSE104\img\sigma.gif, 1/К | C:\Users\admin\Desktop\COURSE104\img\e.GIF | C:\Users\admin\Desktop\COURSE104\img\Image507.gif | | 1 | Гетинакс | 10 | 2 | 50 | 0,04C:\Users\admin\Desktop\COURSE104\img\delenie.gif 0,08 | 0,09 | 4,5 | 30 | | 2 | Картон электроизол. | 100 | 0,5 | 30 | 3 \* 10-4 | 8 \* 10-3 | 1,5 | 15 | | 3 | Фторопласт | 1000 | 0,06 | 40 | 2 \* 10-4 | 8,6 \* 10-3 | 2,2 | 33,5 | | 4 | бумага кабельная | 10 | 0,07 | 55 | 3 \* 10-4 | 8 \* 10-3 | 1,2 | 10 | | 5 | Полиэтилен | 100 | 0,11 | 35 | 2 \* 10-4 | 8,66 \* 10-3 | 2,3 | 30 | | 6 | Лавсан | 1000 | 0,11 | 45 | 3 \* 10-3 | 1,2 \* 10-2 | 1,2 | 13 | | 7 | Стеклотекстолит | 10 | 1 | 60 | 2 \* 10-2 | 0,02 | 3,5 | 22 | | 8 | Бакелит | 10 | 0,2 | 70 | 1 \* 10-2 | 0,05 | 3,0 | 25 | | 9 | Фторопласт | 1000 | 0,04 | 65 | 2 \* 10-4 | 8,6 \* 10-3 | 2,2 | 35,5 | | 0 | Бумага | 10 | 0,1 | 75 | 3 \* 10-4 | 8 \* 10-3 | 1,2 | 10 |   ***Задача № 3.3.3***  Как изменится электрическая прочность воздушного конденсатора, если расстояние между электродами уменьшить от h1 до h2?   |  |  |  | | --- | --- | --- | | № варианта | H1, см | h2, см | | 1 | 1 | 0,1 | | 2 | 1 | 0,01 | | 3 | 1 | 0,001 | | 4 | 0,5 | 0,1 | | 5 | 0,5 | 0,01 | | 6 | 0,5 | 0,001 | | 7 | 10 | 1 | | 8 | 10 | 0,01 | | 9 | 10 | 0,1 | | 0 | 5 | 0,001 |   **3.4 Магнитные материалы**  ***Задача № 3.4.1***  Один из магнитных сплавов с прямоугольной петлей гистерезиса ППГ имеет следующие параметры: поле старта Hо , коэрцитивную силу Hс, коэффициент переключения Sф. Найти время переключения C:\Users\admin\Desktop\COURSE104\img\tao.GIF .   |  |  |  |  | | --- | --- | --- | --- | | № варианта | Ho, А/м | Hc, А/м | Sф, мкк/м | | 1 | 3 | 3 | 14 | | 2 | 4 | 4 | 16 | | 3 | 5 | 5 | 18 | | 4 | 7 | 6 | 20 | | 5 | 8 | 7 | 22 | | 6 | 9 | 8 | 24 | | 7 | 11 | 9 | 26 | | 8 | 12 | 10 | 28 | | 9 | 13 | 11 | 30 | | 0 | 14 | 12 | 32 |   ***Задача 3.4.2.***  Магнитодиэлектрик выполнен из порошков никелево-цинкового феррита HН400 и полистирола с объемным содержанием магнитного материала C:\Users\admin\Desktop\COURSE104\img\alfa.GIF . Определить магнитную и диэлектрическую проницаемость материала C:\Users\admin\Desktop\COURSE104\img\mu.GIF и C:\Users\admin\Desktop\COURSE104\img\e.GIF , если магнитная диэлектрическая проницаемость магнитного материала C:\Users\admin\Desktop\COURSE104\img\mu.GIF а, C:\Users\admin\Desktop\COURSE104\img\e.GIF мимеет заданные значения. Диэлектрическая проницаемость полистирола C:\Users\admin\Desktop\COURSE104\img\e.GIF Д = 2,5.   |  |  |  | | --- | --- | --- | | № варианта | C:\Users\admin\Desktop\COURSE104\img\alfa.GIF | C:\Users\admin\Desktop\COURSE104\img\e.GIF м | | 1 | 0,1 | 40 | | 2 | 0,2 | 20 | | 3 | 0,3 | 60 | | 4 | 0,4 | 35 | | 5 | 0,5 | 50 | | 6 | 0,4 | 25 | | 7 | 0,3 | 45 | | 8 | 0,2 | 30 | | 9 | 0,1 | 65 | | 0 | 0,5 | 55 | |