

**FACULTY OF ELECTRICAL & ELECTRONICS ENGINEERING**

**EXAMINER ANSWER SCRIPT**

**TEST 2: SEM 1 YEAR: 2017 / 2018**

**Subject: ALTERNATIVE ENERGY First Examiner: MOHD SHAWAL JADIN**

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| --- | --- |
|  | **Marks** |
| **(a)** | The maximum open circuit voltage:maximum peak power voltage: minimum peak power voltage of the module: The maximum number of modules per string such that the maximum string voltage shall not damage the inverter: By considering 5% safety margin, the voltage window for the inverter:So, this will allow a maximum number of modules per string:By considering 5% safety margin, the voltage window for the inverter:So, the maximum number of modules per string such that the maximum string operating voltage shall not turn off the inverter.:The minimum number of modules per string: By considering 10% safety margin, the voltage window for the inverter:So the minimum number in a string:The estimate total array power at stc and total number of modules that matches with the inverter. Approximate total array power Aproximate total number of modules: and also .To determine the maximum number of parallel strings:

|  |  |  |  |
| --- | --- | --- | --- |
| Parallel | Series | Total | Ratio |
| 4 | 10 | 40 | 0.71875 |
| **4** | **9** | **36** | **0.79861111** |
| 5 | 8 | 40 | 0.71875 |
| 5 | 7 | 35 | 0.82142857 |

Target derating factor to inverter size k is 0.75 and 0.80. Therefore, the optimum configuration is **either 4 X 9**.  | **1****0.5****1****0.5****1****0.5****0.5****1****0.5****1****0.5****1****0.5****0.5****0.5****0.5****1****0.5****0.5** |
| **(b)** | First, calculate the length of string cable, Cable A; LDC\_cable\_string = (9 x 0.814) + L = 7.326 + 5 = 12.326 mThus, string cable, Based on MS1837:2010 standard, **2.5 mm2** will be selected.Next, array cable, Based on MS1837:2010 standard, **2.5 mm2** will be selected. | **1****1****1****0.5****0.5****1****1****0.5****0.5** |

|  |  |
| --- | --- |
|  | **Marks** |
| **(a)** | Frequently-used charge controllers:1. Pule-Width Modulation (PWM) charge controller
2. Maximum Power Point Tracking (MPPT) charge controller

Function - It prevents the batteries from being over-charged or over-discharged. | **1****1****1** |
| **(b)** |  | **1****1****1** |
| **(c)** | 1. Panel
2. Battery

  = Since, **24 V** system is selected,thus, the configuration for battery is **2 series** and **4 parallel.**  | **1****1****0.5****1****1****1****0.5****1** |
| **(d)** |  | **1****1****1****1** |
| **(e)** | 1. Vmp of the string = 4 x 35.4V = **141.6 V**

From datasheet, Imp is 4.95 A. | **1****1****1** |