

**FACULTY OF ELECTRICAL & ELECTRONICS ENGINEERING**

**EXAMINER ANSWER SCRIPT**

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

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

**Subject Code: BEE 4163 Second Examiner: DR. AHMAD SYAHIMAN MOHD SHAH**

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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 m  Thus, 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** |

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|  | | **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** |