

Uva Wellassa University, Sri Lanka
End Semester Examination – August 2011
BGE 131-3 Basic Mathematics and Engineering
Technology



Time: Three (03) hours

This paper has three parts (Part A, Part B and Part C)

Answer **all** questions

Answer each part in **separate** answer books

Part A

01.) i. Three 30Ω light bulbs are connected in parallel to a 1.5 V battery with negligible internal resistance.

(a) What is the current flowing through the battery ? (5 marks)

(b) What is the current flowing through each bulb ? (5 marks)

(c) If one bulb burns out, does the brightness of the other two bulbs change ? (5 marks)

ii. A rocket moves straight upward, starting from rest with an acceleration of 29.4 m/s^2 . It runs out of fuel at the end of 4 s and continues to go upward, reaching a maximum height before falling back to Earth.

(a) Find the rocket's velocity and position at the end of 4 s. (7 marks)

(b) Find the maximum height the rocket reaches. (8 marks)

(c) Find the velocity the instant before the rocket crashes on the ground. (10 marks)

Assume acceleration of gravity (g) = 9.8 ms^{-2}

02.) Write short notes for any three topics from the following. Each answer should contain minimum 100 words.

- i. Renewable energies
- ii. Greenhouse warming
- iii. Nuclear power plants
- iv. Energy storage in batteries
- v. How TSUNAMI occurs

(20×3=60 marks)

Part B

- 03.) i. What is Product Design and Manufacturing? Explain briefly. (10 marks)
- ii. Why do you need Engineering Drawings? (05 marks)
- iii. What are the basic views you need to present an orthographic projection? (10 marks)
- iv. The isometric view of an object is given in Figure Q3.

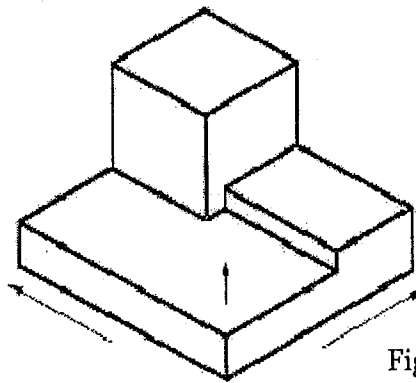
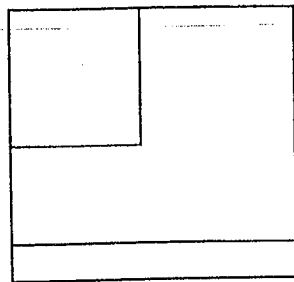


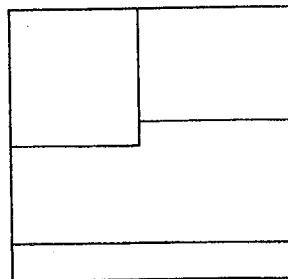
Figure Q3

Select the correct Plan of the object out from the following.

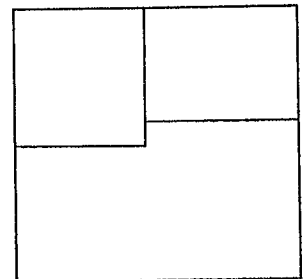
(05 marks)



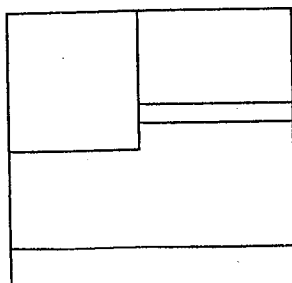
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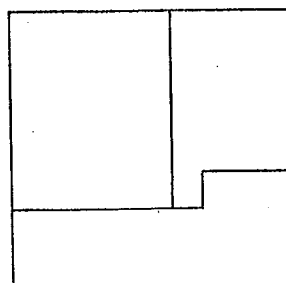
II



III



IV



V

- v. Draw other two basic views of the object in Figure Q3. (10×2 marks)

04. i. Write down 03 Cleaner Production techniques? Explain them briefly. (15 marks)
- ii. Why do you think practicing Cleaner Production techniques are advantageous for industries? (05 marks)
- iii. Define the "Cost of Waste" Iceberg. (10 marks)
- iv. What are the phases in Cleaner Production? Explain them briefly. (20 marks)

Part C

- 05.) i.) Solve the quadratic inequality $6x^2 - x \leq 1$
- ii.) Solve $\ln(x-1) + \ln(x-6) = 2 \ln 6$
- (30 marks)

- 06.) If $p(x)$ is the total value of the production when there are x workers in a plant, then the *Average Productivity* of the work force at the plant is

$$A(x) = \frac{p(x)}{x}$$

- i.) Find $A'(x)$
- ii.) Show that $A'(x) > 0$ if $p'(x)$ is greater than the Average Productivity.
- (40 marks)

- 07.) a.) Evaluate the following integrals

i.) $\int_0^1 2x^2(x^3-1)^4 dx$

ii.) $\int_0^1 \frac{x}{e^{2x}} dx$

b.) Prove that $\int_a^b x^2 dx = \frac{1}{3}(b^3 - a^3)$

