නව/පැරණි නිර්දේශය – புதிய/பழைய பாடத்திட்டம் – New/Old Syllabus

NEW/OLD

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

විදුලිය, ඉලෙක්ට්‍රොනික හා තොරතුරු තාක්ෂණවේදය II
மின், இலத்திரன் தகவல் தொழினுட்பவியல் II
Electrical, Electronic and Information Technology II

16 E II

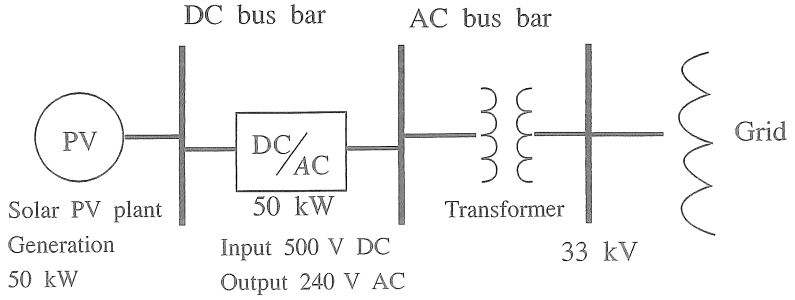
Essay

* *Select two questions from each of the* ***Parts*** **B** *and* **C** *and answer* ***four*** *questions only.*
(Each question carries 15 marks.)

Part B

5. The Covid-19 is a recent pandemic situation that affected the whole world. During this pandemic certain technical and non technical measures have been taken in order to prevent the spread of the viral infection.
   (a) Briefly explain how 'social distancing' was used to prevent of Covid-19 spread.
   (b) Briefly explain **two** other **non** technical measures that were used to prevent the spreading of the virus.
   (c) Describe **three** modern technology applications can be used to control the spreading of the virus.

6. Solar PV plants are developed in Sri Lanka to enhance the renewable energy component of the power supply mix. A large number of small capacity solar PV panel units are interconnected in a solar plant. Output voltage from a solar PV module will vary depending upon the availability of sunlight. A module has a nominal power and maximum voltage output. These units can be connected in series and or in parallel to obtain the required voltage and current outputs. Output of a collection of solar modules will be connected to a DC to AC converter and then a transformer is used to convert AC voltage to the relevant grid voltage. (refer the detailed diagram given below)



PV Solar module data (for one unit)

- Power : 200 W
- Voltage V_{max} : 50 V

   (a) Compute the number of PV modules to be used in a Solar PV plant of 50 kW.
   (b) Assume that the width and length of a solar PV unit is 34" and 52" respectively. Compute the total area required for this plant.
   (c) A DC bus voltage of 500 V is required at the DC to AC converter. Suggest a methodology to generate the required DC Voltage from the given PV modules.
   (d) Suggest a method to supply electricity from the solar PV plant during the night when electricity from the main grid is not available.

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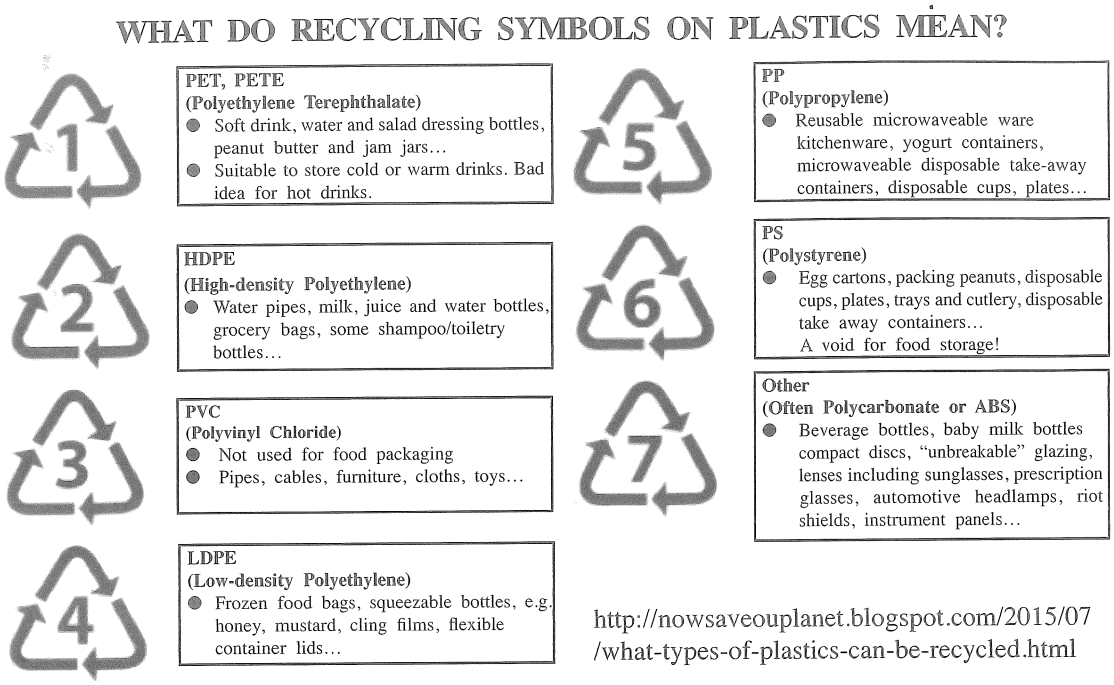
(e) Describe **two** benefits for Sri Lanka in using solar PV plants.

7. Generation and unsafe disposal of plastic waste is an ongoing issue in Sri Lanka. Even though we use 'safe' plastics to wrap food, being poly-carbonate compounds, they tend to bond with harmful chemicals in unregulated disposal sites. The leachate (i.e. liquid waste) and micro-plastics produced tend to contaminate surface and groundwater bodies, and the marine environment. These pollutants enter the food chains of human beings and animals.

Figure shows the classification system developed by the Society of Plastic Industry, in 1988.



http://nowsaveouplanet.blogspot.com/2015/07/what-types-of-plastics-can-be-recycled.html

The recycling rates of each type reduces with ascending numbers. This depends on the usage, the collection, the technology and the cost of processing of each type. The recycled products should also be used as a raw material for another finished product. The recycling percentage of each type in the developed world is around 20-40%. A small portion is burnt to produce energy, many end up in regulated and unregulated landfills, waste dumps, or in the sea.

(i) Classify the different types of waste produced in your local government (Pradesheeya Sabha, Urban council or Municipal Council) division, based on the above classification.

(ii) Propose to your local government institution as to how they should handle the different types of wastes. Identify their respective cost implications to the community.

(iii) Discuss **three** strategy to influence your community to use alternate non-plastic products or to reduce plastic usage significantly.

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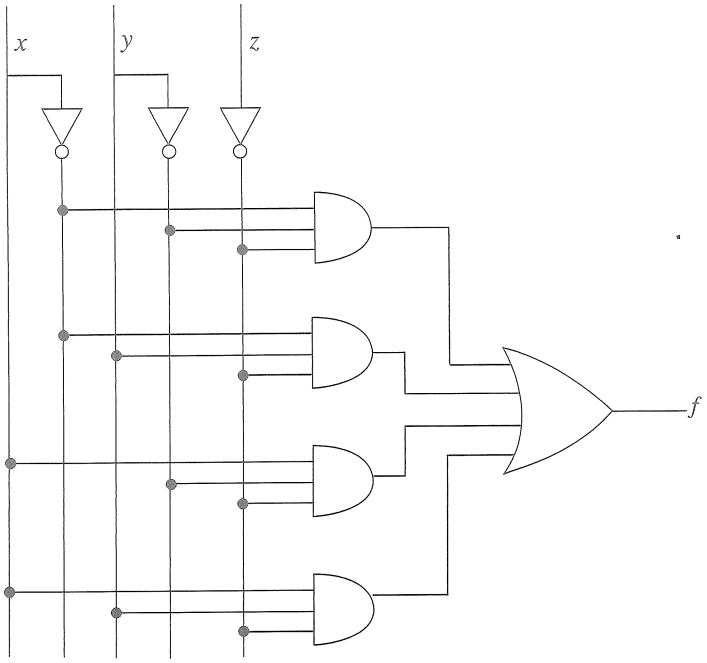
Part C

8. (a) A combinational logic circuit with three inputs and one output is shown below.



(i) Derive the Boolean expression for the output f of the circuit.

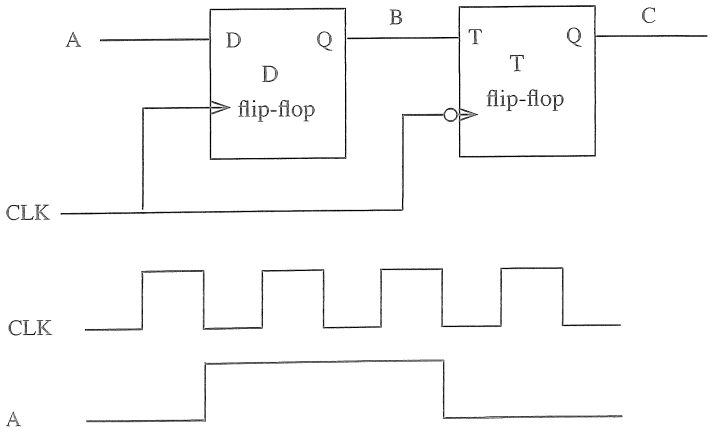
(ii) Using relevant axioms and theorems, show that the Boolean expression derived in (i) can be simplified as $f = \bar{z}$.

(iii) Derive the truth table for the circuit.

(iv) Briefly explain whether the above circuit can be used to detect even numbers between 0 and 7.

(b) (i) Draw the circuit of an SR flip-flop using NAND gates.

(ii) A simple sequential logic circuit consisting of a positive-edge triggered D flip-flop and a negative-edge triggered T flip-flop is shown below. If the initial states of both flip-flops are '0', draw the signals B and C for the input signal A and the clock signal 'CLK'.



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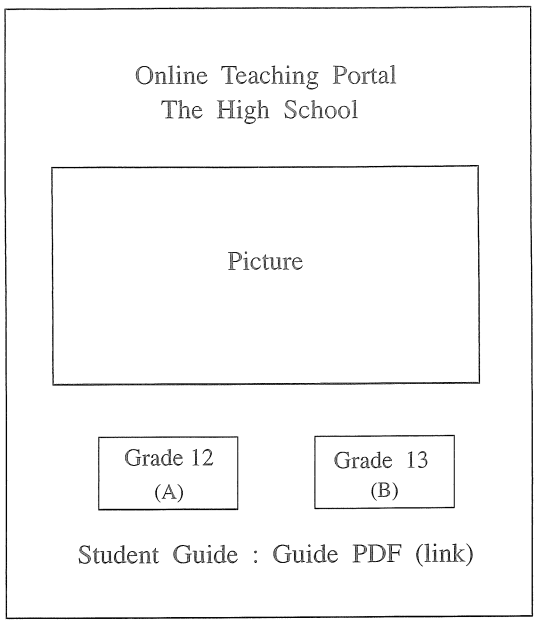
9. Following web interface is developed for facilitating online teaching during the Covid-19 pandemic. Details can be accessed through the grade 12 (A) and 13 (B) tabs.



(a) Write a program with HTML tags to develop the above web interface.

(b) A separate web page is developed for each grade including lessons in PDF forms and video lectures.

(i) Sketch a layout for a separate page of Grade 12.

(ii) Write a program with HTML tags to develop the web page for Grade 12.

(c) An online form is suggested to get the questions and feedback from the students.

(i) Sketch the layout for an online form.

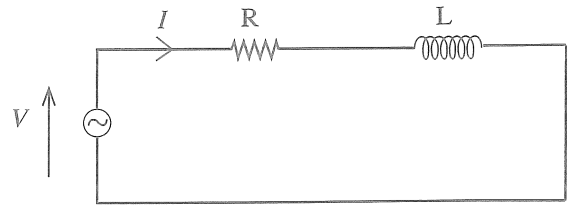
(ii) Suggest one option for preparing the online form.

(iii) Explain how to link the online form to your web page. Write the relevant HTML program (only the relevant section).

10. (a) A resistor will consume active power when connected to an alternating current source but ideal capacitor or ideal inductor will not consume active power when connected to an alternating current source.

(i) Draw the phasor diagrams indicating supply voltage and current through the component when a resistor, ideal inductor and ideal capacitors are separately connected to alternating current sources.

(ii) Consider following circuit with resistor (R) and an ideal inductor (L) connected to an AC source. Draw the phasor diagram and indicate supply voltage V and current I.



(iii) Write expressions for active power and reactive power consumption of the circuit indicated in (ii).

(iv) What are the units for measuring active power and reactive power?

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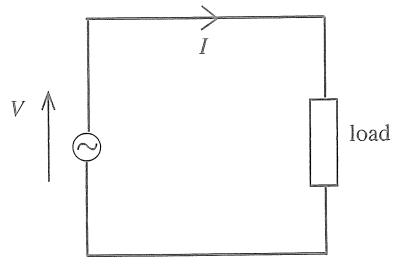
(b) An inductive load (not ideal) is connected to an AC source as in following figure.



(i) Draw the phasor diagram.

(ii) Define power factor.

(iii) Explain how to improve the power factor.

(iv) What is the main advantage of improving power factor towards unity power factor (i.e. 1)?

* * *