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 14.08.2018 / 1300 - 15 00 Cg.Gu, quecchequella an eventagi and event and eventagi and event	අப்சலன சூலது கல்கின் எனு (அக்கி சைகு) நிலைக்கு, 2018 முலைக்கினு கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2018 ஓகஸ்ற் General Certificate of Education (Adv. Level) Examination, August 2018
 EgGe, querelagistin no according (and the status) and the status of the status). Electrical, Electronic and Information Technology 1 Instructions: Answer all the questions. Write your Index Number in the space provided in the answer sheet. Use of calculators is not allowed. Instructions are given on the back of the answer sheet. Follow those carefully. In a cross (x) in accordance with the instructions given in the back of the answer sheet. Young's modulus of steel is 1.9x10¹⁰ N/m². 1N=10⁵ cm g/s². How is this value expressed in CGS (Centimeter, Gram, Second) units? (1) 1.9x10⁹ (2) 1.9x10¹⁰ (3) 1.9x10¹¹ (4) 1.9x10¹² (5) 1.9x10¹³ Figure shows a mercury column in a simple barometer. A - The height H depends on the attrosphere in the column increases the height H. D - The height H is an indicator of the maximum suction head when pumping water from a well. Which of the above statements that describe certain chemicals. A - A standard motor car battery has Suffuric Acid and Lead. B - Soap molecule can attract water at one end, and oil at the other. C - Toilet bowl cleaning liquid has Sodium Hypochlorite. D - Salt helps to relax cramped muscles. Which of the above statements describe a chemical used at home? (1) A, B and C only. (2) A, B and D only. (3) A, C and D only. (5) A, B, C and D only. (4) B, C and D only. (5) A, B, C and D only. (5) A, B, C and D only. (5) A, B and D only. (6) A, B and C only. (2) A, B and D only. (7) A, B and C only. (2) A, B and D only. (8) Consider the following scatternents describe a chemical used at home? (1) A, B and C only. (2) A, B and D only. (3) A, C and D only. (4) B, C and D only. (5) A, B, C and D anl. 4. Which of the following actions demonstrate entrepreneurship traits of an owne	14.08.2018 / 13.00 - 15.00
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AL/2018/16/E-I - 3 -9. A uniform crate has a weight of 500 N (approximately equal to 50 kg) and it is pushed with a force of 200 N as shown in the Figure. Coefficient of static friction between the crate and ground is 0.3. 200 N 500 N The friction force at the limiting equilibrium state is (1) 186 N. (2) 195 N. (3) 200 N. (4) 260 N (5) 500 N. • Following figure shows a measurement of a steel rod taken from a vernier calliper. Use the figure to answer questions 10 and 11. 10. What is the minimum reading of the vernier calliper in mm? (1) 0.005(2) 0.01 (3) 0.02 (5) 01 (4) 0.05 11. What is the diameter of the steel rod? (1) 2 75 cm (2) 2.80 cm (3) 2.55 cm (4) 2.59 cm (5) 2.42 cm 12. Which of the following describes the scale in nanotechnology? (1) $0 \,\mathrm{mm} - 100 \,\mathrm{mm}$ (2) 10^{-9} mm - 9×10^{-6} mm (3) 10^{-3} mm - 10^{-6} mm (4) 10^{-6} mm - 9×10^{-6} mm (5) 10^{-7} mm - 10^{-6} mm 13. Which of the following statement is most appropriate to the nanotechnology? (1) It is a technology related to static electricity. (2) It can be named as a green technology. (3) It is a branch of robotic technology. (4) Lotus effect can be described using nanotechnology (5) It can be named as a new automobile technology.







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22. A motorcycle accelerates constantly from the rest for 10 seconds and maintains a constant velocity for another 10 seconds. Due to a pedestrian crossing the road, the rider applies sudden brakes to slow down and keeps moving in a lower velocity than before. Which velocity-time graph represents this motion correctly?



23. As shown in the figure gymnast usually takes a long pole when he walks on a rope at heights. What is the best explanation for this?

- (1) To use the pole to touch the floor in case he tilts.
- (2) To establish the balance by wide spreading the weight of the person and pole
- (3) To entertain the crowd more as it is difficult to walk with the pole
- (4) To change the moment of inertia to re-establish the balance using the pole in case of out of balance situations.
- (5) To increase the reaction force from the rope.



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100µF 100µF

(3)



20µF 20µF

(4)

[See page eight

1ŀ

10µF 10µF 10µF 10µF 20µF

(5)



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32. The figure shows sinusoidal signal which is observed by an oscilloacope. Voltage magnitude scale and time scale settings of the oscilloscope are 10V/div and 2ms/div respectively. Select the answer that shows the period and frequency of the sinusoidal signal respectively.

- (1) 20 ms, 50 Hz
- (2) 10 ms, 100 Hz
- (3) 10 ms, 50 Hz
- (4) 40 ms, 50 Hz
- (5) 20 ms, 20 Hz



33. Following figure shows how three voltmeters and three ammeters are connected to measure voltage and current across each branch. Assume that all meters are ideal.



A - V_1 , V_2 , V_3 voltmeters and A_1 , A_2 , A_3 ammeters are connected properly. B - Readings of all voltmeters are equal.

C - Sum of A_2 and A_3 ammeter readings are equal to reading of A_1 .

Select the answer with correct statement/s.

- (1) A only(2) B only(3) A and B only(4) B and C only(5) all A, B, and C
- 34. Consider the following circuit with a resistor network.



Due to a fault, $100 \text{ k}\Omega$ resistor was damaged and open circuited across it. Furthermore, $2 \text{ k}\Omega$ resistor was also damaged and short-circuited across it. What is the total current measured in the ammeter after the faults?

(1) 100 mA (2) 10 mA (3) 1 mA (4) 0.1 mA (5) 0 mA

- 35. An inductive load is connected to an AC supply of V and load consumes I current at a power factor of $\cos \theta$. Active power (P) and reactive power (Q) consumption of the load are given by
 - (1) P = VI, Q = VI
 - (3) $P = VI \cos \theta$, $Q = VI \sin \theta$
- (2) $P = VI \cos \theta$, Q = VI(4) P = VI, $Q = VI \sin \theta$
- (5) $P = VI \cos \theta$, Q = 0

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36 Consider following statements: A - Documents, pictures can be easily sent by using email facilities such as Gmail, hotmail and vahoo B - Online data storage and online documents can be used for preparing a document by a group of people C - A specific user account and password should be used for login to any webpage. Select the correct answer with statement/s regarding the use of information technology. (2) B only (3) A and B only (1) A only (4) A and C only (5) A, B, and C all 37. A logic circuit is shown below. - D Select the correct output for D. (2) $D = A + \overline{A} + B$ $(3) \quad \mathbf{D} = \mathbf{A} + \mathbf{A}\mathbf{B}$ (1) $D = A\overline{A} + \overline{B}$ (5) $D = A\overline{A} + A$ (4) D = AB38 A 100 W incandescent bulb is going to be replaced by a 20 W CFL bulb. The bulb is switched ON 4 hours a day and cost of 1kWh is Rs. 10/=. What is the monthly saving from the replacement? (1 month = 30 days)(2) Rs. 100 (3) Rs. 96 (4) Rs. 36 (5) Rs. 24 (1) Rs 120 39 A 2 kW, 230 V, 50 Hz electronic iron is connected to a domestic electric supply in Sri Lanka. Suddenly the supply voltage dropped to 200 V. What is the correct statement regarding the above situation? (1) Supply frequency will increase. (2) Power output will decrease. (4) Reactive power output will increase (3) Supply current will increase (5) All of the above. 40 Select the components that are required to identify an earth leakage in a house wiring. (1) RCCB, MCCB (2) RCCB, Socket Outlet (3) MCCB, earth electrode (4) RCCB, earth electrode (5) RCCB, MCCB, earth electrode. 15Ω 41 A multimeter with small internal resistance is used to measure the current ANN in the following circuit. Select the correct statement for this measurement. 15 V 📼 (1) Multimeter should be connected parallel to the resistor, (2) Current reading is higher than 1A. (3) Voltage drop across the resistor is less than 15 V. (4) The supply current is increased after connecting the meter. (5) All of the above 42 A step-up transformer refers to one in which (1) the voltage across the secondary is higher than the primary. (2) the current in the secondary is higher than the primary. (3) the power to the load is higher than delivered to the primary. (4) the power to the load is depending on the primary current. (5) all of the above 43. 25 W Electric equipment is designed to use with 10 V supply. It is going to be connected to a 5V supply. What is the resistance that should be connected with the electrical equipment to limit the current to the rated? (1) 0.5Ω $(3) 2\Omega$ (4) 3Ω (5) 4Ω (2) 1Ω

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• Answer questions 48, 49 and 50 based on the following production process. Consider a conveyor system used in a production process of a bottled drink. This conveyor is operated at constant speed by a DC motor (M).



48 Assume that sensor output status will be logic '1', when sensor is covered by the bottle space filled with drink. However sensor output is '0' when sensor is only covered by empty bottle space or sensor is not covered. Find the answer with correct output of sensors S_1 , S_2 , S_3 and S_4 when b_1 , b_2 , b_3 , b_4 and b_5 bottles are passing the sensor array.



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Percentage

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ලි ලංකා වනත ය இல்ஙகைப் பரீட் Department Es දී ලංකා වන ය இலங்கைப் நீ	രാഗമാശ്ചേറ്ററി രൂ രംമ അവള് ക്രീതങ്ങകണ്ഥ നേസമാനം, Sa Lauka സ്റ്റോറ്റ് മാശ്ചാനം പ്രാഗമാശ്ചാനം പ്രാഗമാണ് പ്രാഗമാണ് കാരിവ് General (ອ້ອງອັດເວລີ ອີອງອັດເວລີ ອ້ອງອັດເວລີ ອີອງອັດເອລີ ອີອງອັດເວລີ ອີອງອັດເອລີ ອີອງອັດເອລີ ອີອງອີອ ອີອງອັດເອລີ ອີອງອີອ ອີອງອີ ອີອງອີອ ອີອງອີອ ອີອງອີ ອີອງອີອ ອີອງອີ ອີອງອີອ ອີອງອີ ອີອງອີ ອີອງອີອ ອີອງອີ ອີອງອີອ ອີອງອີ ອີອງອີ ອີອງອີອ ອີອງອີ ອີອອີ ອີ ອີອງອີ ອີ ອີ ອີອງອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອີ ອ	கை பெரை கண்ணைக்களம் இல்வணைப் பிடனத் கொப் பரிடன் தாறினைக்களம் இல்வகைப் பிடனத் Pepartment of Examinations, Sri Lanka இல்வகைப் பிடனத் காற (அன் கூறு) பிரைக்கு ப் பத்திர (உயர் தருப் பரிசை, 2018 கொண்டு ப் பத்திர (உயர் தருப் பரிசை, 2018 கொண்டு ப் பத்திர (உயர் தருப் பரிசை, 2018 கொண்டு
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PART A – Structured Essay Answer all four questions on this paper itself. (Each question carries 10 marks)

1. An isometric view of a machine component is shown in the figure. Machine component is symmetric along the vertical plane passing through X-X. Assuming any missing dimensions, draw the following views to a suitable scale using first angle projection principle. Show all relevant dimensions in the sketches. Use the graph sheets given on page 3 and 4 to answer the questions. (All dimensions are in mm.)



Do not

write

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column

Index No. :

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2. Assume that you have been appointed as the IT technical officer responsible for improvi IT facilities of a school. Answer the following questions related to IT facilities.	ng Do no write in this
(a) School has decided to establish a computer laboratory with 25 desktop computers. The laboratory will be used as a common facility for all students. The laboratory should inclu facilities for preparing documents, presentations and searching information in the International Science (Science) (Science	nis ide .et.
(i) State four hardware units required for a fully functional computer,	
(1)	***
(2)	
(3)	
(4)	
(ii) Give two software required for the computer units.	
(1)	88
(2)	
(iii) State one facility required for the computers.	
the fully functional computers.	17.9 (A.9.)
	.++
(1) State one software package required to carry out video conferencing.	
	++
)+5
(c) Assume that a project is being conducted by a group of 10 students under the supervision of a teacher from a school in a remote area, students are working in computer laboratory the school and the teacher is at another school. Furthermore, assume that relevant hardwa and internet facilities are available for the teacher and the students. State required softwa facilities for simultaneously preparing a report by 10 students and as the teacher can comme while preparing the report.	on of re nt
	×+.
	(*)
	##3:
	-

[see page six

the	sider following circuit which connects a DC source, two resistors and a bulb, and answer questions.	writ in th colu
(a)	Figure 03 List the measuring equipments required for measuring voltages across R, 2R resistors, bulk supply voltage and circuit current	
	buib, supply voluge and enclar carrons.	
(c)	Draw the circuit and indicate how a switch can be inserted to control (ON/OFF) the bulb.	

[see page seven

(d) It has been decided to modify the circuit to reduce the current to half of the previous value by adding more R resistors. (Assume that any number of R resistors are available).
 Do not write in this column
 Sketch a suitable arrangement of the modified circuit.

(e) Further initial circuit (in figure 03) is modified to double the circuit current by adding additional R resistors. (Assume that any number of R resistors are available.) Sketch a suitable arrangement of the modified circuit.

4. (a) (i) List factors affecting the synchronous speed of an induction motor.

ii)	Assume a single phase induction motor with four starting and four running winding in the stator. Calculate the synchronous speed when it is connected to a 230V 50Hz AC supply
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(b) State the meaning of each item in the following specification table (name plate) of an write induction motor.
Do not write in this column

Induction Motor				
	3ф		: 0.7 kW	
	: 2A		; 1420 RPM	
	: 400 V		:¥	
	: 50 Hz			

- (c) There are different types of DC motors based on how armature winding and field winding are connected. Sketch diagrams and indicate how field and armature windings are connected in the following DC motors.
 - (i) DC series motor

(ii) DC shunt motor

(iii) DC Compound motor

(iv) Separately excited DC motor

[see page nine

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සියලු ම නිමිකම් ඇවිරිණි / ලංගු	் பதிப்புரிமையுடையது /Ali	Rights Reserv	ed]		
இ ஒவை தல்ல ஒடிப்பல்வேலு இலங்கைப் பரிட்சைத் தினைவ் Department of Examinations Sro இ ஒவை தல்ல ஒடிப்பில்லது இலங்கைப் பரிடனாத திலைன்?	ම් ලංකා විතාන දෙපා හි ලංකා යාගාර් இலාමනායා 1 යාka Department නිලෝකානා ය මු ලංකා මිතාන පැහැර මිතාන Departmen	o ບິໝາສ ອຽດນ ນໍ່ ນີ້ໄມ້ເອຍສູ່ It of Examina	රිත්මේන්තුව ල්කාණයකා tions, Sri Lar	වහාශ දෙපාර්තමේන්තුව ශී ලංකා වහාශ දෙපාර්තමේ ඉතානාතනාක இහතානයා පාරිකාවන තිබ්බානාත i Lanka Department of Examilian දෙපාර්තමේන්තුව ශී ලංකා වතාශ කතාක இතාතනයා පාරියනවන	මන්තුව සෙංකාග
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	_	Essay			
* Select two question (Each question car	ns from each of the Pa ries 15 marks)	\mathbf{r} ts \mathbf{B} and \mathbf{C}	and answer j	four questions only.	
		Part B			
spreading rapidly, the spread of dise. (a) In order to cu ① To control ② To keep at ③ To prevent Brieffy explain two (i) above ① at (ii) above ② at (iii) above ③	specially in slum area ase, in inter and intr orb this epidemic, fol breeding of mosquit way the mosquito ca spreading virus to i o suitable technologic at the school at your home.	as This situa a regional c lowing actio to carrying t rrying the v inter regions cal measures	ation has pos ommunities. ns could be he virus irus you could	taken.	ollir
(b) You are appoint community. But this.	nted to educate the per riefly explain how ye	eople in slum ou could use	areas to co technology	ntrol the epidemic within their to make people aware to co	ow ontre
A smart building energy and contrib the design of the in a smart building in the building are	is a new concept in uting to achieve the electrical system is v project, answer the identified as below.	the today's sustainability very importa- following qu	s world with goals. In o nt. Assuming testions. Mai	a prime objectives such as sa rder to achieve sustainability that you are the technical o n electricity consuming equipr	avin goa ffico nen
	Equipment	Power	Quantity	Average daily usage (hours)	
	Bulbs	20 W	5	7	
		100 W	2	2	
	Air Condition	4 kW	1	6	
	Refrigerator	100 W	1	15	

(a) What is the total daily electricity consumption in kWh?

Others

(b) Calculate the maximum possible current taken by the building assuming 240 V supply voltage?

1

5

200 W

(c) A single phase transformer is used to supply the above current. What is the minimum capacity of the transformer needed in kW?

- (d) In order to convert the building into a sustainable building the owner is suggested to use solar energy from a roof-top 1kW photovoltaic (PV) plant. It will generate energy for 4 hours per day. The generated electricity will be sold to Ceylon Electricity Board (CEB) with the rate of Rs. 20 per kWh. Calculate the total income per month of 30 days from solar energy.
- (e) Details of 1kW PV plant is given below.



(i) Find the maximum possible AC current generating from the PV plant.
(ii) Find the suitable rating of the fuses at point (1) and (2).

3. A rural household receives pipe borne potable quality water, under gravity, from a community water supply scheme. It delivers water at daily, an average rate of 2 litres per minute, for a period of 5 hours, from 10 p.m. to 3 p.m.

The household has two adults, and three children of school going age and water is used for drinking, cooking, washing clothes, sanitary requirements and for home gardening.

- (a) Estimate the daily household water requirement for each purpose listed above, stating the assumptions you have made.
- (b) Show on a sketch the layout of the water storage and distribution system for this dwelling. Name the components of the system while stating their specific use.
- (c) Suppose that the household wishes to collect rain water to enhance its water needs. Propose how you would integrate the rain water collection system, to meet the domestic water needs. Use of sketches is expected to convey the proposal.

Part C

4. (a) Answer the following questions based on the combinational logic circuit given in the following figure.



(i) Write the Boolean expression for the logic circuit output Y.

(ii) Simplify the above to obtain the most simplified Boolean expression.

(iii) Write the truth table for the simplified Boolean expression.

(iv) Draw the logic circuit for the simplified Boolean expression.

(b) Consider the following flipflop circuit and answer the questions.



(i) Write the truth table for the Set-Reset function of the SR flipflop. (ii) Obtain the output Q and \overline{Q} for the following Set-Reset sequence.



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- 5. Assume that you have been asked to develop a new website using HTML for the new science laboratory of the school. Front page of the website is to be developed as given here. There is a plan to develop separate web pages accessible from the front page for 'About', 'Facilities' and 'Student Activities'.
 - (a) Write the program with HTML tags to develop the above front page.
 - (b) Laboratory equipment such as meters, oscilloscopes, basic electrical and electronic items have been already purchased.

Write HTML program to develop a separate web page for the facilities including details and images.

- (c) Students are planning to have an electronics design competition for students.
 - (i) Write HTML program for preparing a separate web page for student activities.
 - (ii) An application for the competition has already been prepared by using an online form. Modify the HTML in part (i) to add a link for the application in the bottom of the web page.



6 Passive electrical components such as inductors and capacitors can be used to control AC.

- (a) Following figure 6.(a) shows an experimental set-up developed to study the effects of inductors when connected to AC
 - (i) Write an expression for inductive reactance.
 - (ii) Calculate the inductive reactance of the inductor when supply AC voltage is 230 V in magnitude and 50 Hz in frequency. Here inductance (L) of the inductor is 10 mH.
- (b) A group of students has replaced the inductor in the circuit of part 6.(a) by a capacitor as given in figure 6 (b).
 - (i) Write an expression for capacitive reactance
 - (ii) Calculate the capacitive reactance of the capacitor when supply voltage is 230 V and frequency is 50 Hz. Here capacitance of the capacitor is $1000 \,\mu\text{F}_{\odot}$
- (c) State a method to improve the power factor of load which is in a series connection of resistor (R) and inductor (L).

* * *

