1601/105 1602/105 ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY Oct/Nov. 2016 Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONICS ENGINEERING (POWER OPTION) (TELECOMMUNICATION OPTION)

MODULE I

ELECTRICAL AND SOLAR INSTALLATION TECHNOLOGY

3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of **TWO** sections; **A** and **B**. You should have the following for this examination: answer booklet; drawing instruments.

Answer any THREE questions from section A and any TWO questions from section B. Maximum marks for each part of a question are as indicated. Candidates should answer the questions in English.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.



- Answer any THREE questions from this section. List three authorities which are involved in power production and distribution in Kenva. (3 marks) (b) (i) State three advantages of a.c system over d.c system. Draw a labelled circuit diagram of a three phase four wire system and show the (iii) distribution of both single and three phase supply. (7 marks) With the aid of a diagram show the parts of a hydro-electric power station. (c) (10 marks) 2 Distinguish between 'current rating' and 'fused current' as used in circuit protection. (a) (2 marks) (b) Explain the term "discrimination" as used in circuit protection. (2 marks) direct earthing; V This is her conting feel romes place when der Explain the following: (c) (i) This is the contains that It takes may in the Concreted a earth concentric wiring. (ii) starting Construction is made organis (d) (i) State two reasons for earthing an electrical installation. Due to converte protection (ii) Draw a labelled diagram of a current operated earth leakage circuit breaker. (12 marks) 3. State two properties of the following materials: (a) copper - 7 1+ 15 less danser (ii) aluminium. - 1 Has no (4 marks) With aid of a diagram, outline the procedure of making a brittania joint. (b) (8 marks)
 - (c) Distinguish between a conductor and an insulator. (4 marks)
 - List two factors that determine current carrying capacity of electric cables. (d) (i) Determine the cross-sectional area of a copper wire 20 m in length with a

(11) resistance of 0.25 Ω . Take resistivity of copper as 0.02×10 " Ω m.

(4 marks)

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0.25×20 =5 2

200a R=0.255 1 = 20m

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- Draw circuit diagrams of the following d.c. motors:
 - (i) shunt;
 - (ii) series;
 - (iii) compound wound.

(6 marks)

- (b) Describe the following parts of a d.e. machine:
 - (i) armature;
 - (ii) poles;
 - (iii) yoke.

(9 marks)

(c) Draw a labelled diagram of a single phase a.c. capacitor start induction motor.

(5 marks)

- 5. (a) State three IEE regulation requirements regarding
 - (i) 13 A socket outlets;
 - (ii) installation at consumers intake point.

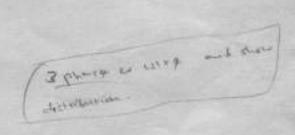
(6 marks)

- (b) With aid of a labelled diagram show how two lamps can be controlled by two single pole switches independently using two joint boxes. (4 marks)
- (c) Draw a labelled diagram of a consumer unit and indicate cable sizes and fuse ratings for the following outgoing final circuits:
 - (i) lighting circuit;
 - (ii) cooler unit;
 - (iii) water heater,
 - (iv) 13 A socket wired in ring.

(6 marks)

(d) List the tests carried out on a completed installation.

(4 marks)



SECTION B (60 marks)

Answer any TWO questions from this section.

6.	(a)	State two sources of:		
		(i) renewable energy;		
		(ii) non-renewable energy.	(4 marks)	
	(b)	Explain the following terms as used in solar systems.		
		(i) irradiance;		
		(ii) isolation.	(4 marks)	
	(c)	(i) List four factors that determine the output of a pv solar module.		
		(ii) Explain the effects of 'shading' on a pv solar module.	(6 marks)	
	(d)	Draw an I-V curve, and on it show the following:		
		(i) maximum rated power (p _m);		
		(ii) maximum power current (I _{mp});		
		(iii) maximum power voltage (V _{no});		
		(iv) short circuit current (1_);		
		(v) open circuit voltage (V_).		
		(v) Open cucun votage (v _{oc}).	(6 marks)	
7.	(a)	Describe the following accessories used in solar electric installation:		
		(i) consumer unit;		
		(ii) socket outlet.		
			(4 marks)	
	(b)	(i) With aid of a labelled diagram describe the construction of a solar c	ell.	
		(ii) Outline the correct sequence of connecting and disconnecting a PV module, battery and load from the charge controller.	solar	
			(6 marks)	
	(c)	Explain the following conditions which occur in the solar batteries:		
		(i) sulphation;		
		(ii) stratification.	(4 marks)	
	(d)	With aid of circuit diagrams, distinguish between series and shunt type char	The second secon	
		controller.		

- 8. (a) (i) List three tools or materials used in carrying out maintenance of solary tvet. com
 installations of took solary tvet.
 - (ii) Outline the maintenance carried out on a PV solar module.
 - (b) Explain 'total daily system energy requirement' as used in sizing PV solar systems.
 (2 marks)
 - (c) Describe three factors considered during sizing of:
 - (i) an inverter, (o
 - (ii) a charge controller.

(6 marks)

(d) Outline five checks carried out during testing and commissioning of a solar installation, (5 marks)

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