



5. Refer **Personal Protective Equipment (PPE)** at work.
- (a) Explain why a PPE must be worn at the place of work. **(3 marks)**
- (b) i. Name the vulnerable parts of the body which may need protection. **(4 marks)**
- ii. For any three vulnerable parts of the body listed in (b) (i) above, explain briefly why such protection is recommended by the PPE at work regulations. **(6 marks)**
- (c) List the responsibilities that an employee (or worker) in the electrotechnical industry has to obey by law to assist the employer. **(3 marks)**
- (d) The rules and regulations of the working environment are communicated to employees by written instructions, safety signs and symbols. Sketch and state the message of any two safety signs commonly displayed at the place of work. **(4 marks)**
6. (a) Draw a diagram for the following:
- i. **two-way** switch control **(4 marks)**
- ii. **two-way and intermediate** switch control **(5 marks)**
- iii. **ring circuit**. Please specify the floor area and the cable size to wire the ring circuit. **(6 marks)**
- (b) A large machine shop is to be illuminated by discharge lamps. Explain what is meant by the stroboscopic effect and how it can be eliminated in a machine shop. **(5 marks)**

Total: 100 marks

EXAMINATION FOR AUTHORISATION A

Paper 2: Electrical Installation Technology

Date: 14 July 2022.

Time: 09:00 – 12:00 (Three hours)

END OF EXAMINATION PAPER

This examination paper contains six questions. Candidates are requested to answer any FIVE (5) questions. Candidates are also requested to include all their work in the booklet provided. Every answer should include all workings, any necessary diagrams and formulae. Use a fresh page for each different question. Each question carries 20 marks.

1. (a) A 230 V 50 Hz single phase supply extractor fan has a rating of 6 kW at 0.8 p.f. lagging and is protected by a BS 88 Part 2 fuse. The distribution board is distant 50 m away from the extractor fan. The cables used to supply the extractor fan are to be single core cables, PVC insulated, installed in steel trunking with three similar circuits. Assume an ambient temperature of 35°C and that the voltage drop in the cables is limited to 2.5%. Using the below tables and ignoring any diversity, calculate:
- (i) The full load current of the motor (I_L) (4 marks)
 - (ii) The rating of the fuse (I_n) (4 marks)
 - (iii) Minimum current rating of cables (4 marks)
 - (iv) Minimum cable c.s.a. (4 marks)
 - (v) Actual voltage drop in the cable. (4 marks)

Refer to Tables 1.1 to 1.4

6A	10A	16A	20A	32A	50A
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No of Circuits	1	2	3	4	5	6	7
C_g	1.0	0.8	0.7	0.65	0.6	0.57	0.54

Ambient temperature (°C)	25	30	35	40	45	50	55	60
C_a	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.50

Cross Sectional Area mm ²	Current carrying capacity (A)	Voltage drop mV/A/m
1	13.5	38
1.5	17.5	25
2.5	24	15
4	32	9.5
6	41	6.4
10	57	3.8
16	76	2.4
25	96	0.145

2. (a) What is meant by the following terms related to an electrical installation:
- i. Exposed conductive parts (2 marks)
 - ii. Extraneous conductive parts (2 marks)
 - iii. Circuit protective conductor (2 marks)
 - iv. Earthing conductor. (2 marks)
- (b) How does earthing provide protection? (5 marks)
- (c) With the aid of a diagram explain the operation of a single phase Residual Current Device (RCD) (7 marks)
3. (a) Make a detailed diagram of one form of relay as used in a closed circuit burglar or fire alarm system. Your diagram must show:
- i. the construction of the relay
 - ii. the normally open contacts
 - iii. the normally closed contacts
 - iv. the bell. (12 marks)
- (b) How does the circuit work? (8 marks)
4. (a) What is a circuit breaker? Give examples where it is used. (5 marks)
- (b) Using a clear and well-labelled diagram explain the principle of a simple circuit breaker. (5 marks)
- (c) Name five advantages of a circuit breaker over a fuse. (5 marks)
- (d) When a circuit breaker is used a spark or arc occurs and this has a harmful effect on the contacts of the circuit breaker. Name five methods used to reduce this spark. (5 marks)