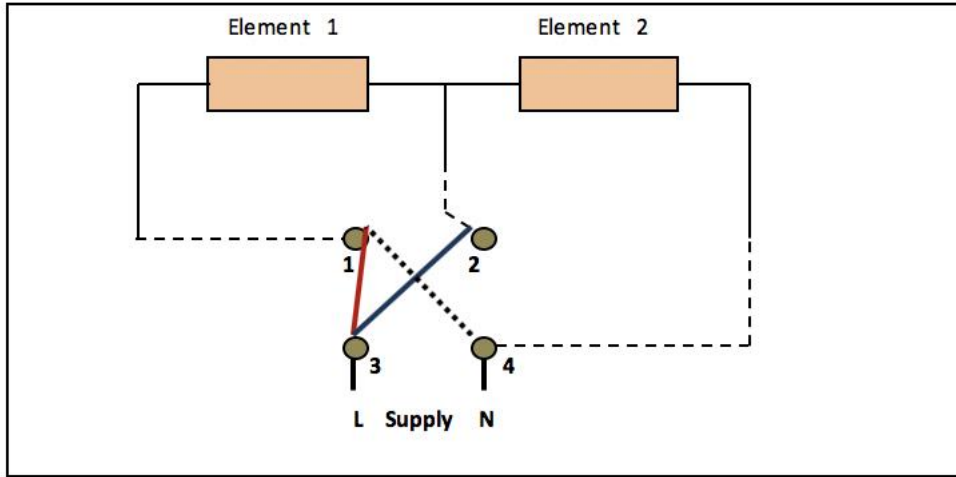


SPARKS Magazine – Winter Issue 2019 - Answer Sheet

Page 45 – Heater circuits

Task 1



Task 2

Setting	Switch terminal connections	Heating element connection arrangement (Series, Parallel, single resistance)
Low	3 links to 1	Series (low heat)
Medium	3 links to 2	Single (medium heat)
High	3 links to 2 4 links to 1	Parallel (high heat)

Page 46-7 – Circuit protection devices

1. **160A**
2. **145A**
3. **500A**
4. The device is a **fuse – switch**, and (b) **HRC or HBC fuses** to BS88-2 Fuse system E (bolted)
5. The top or curved section represents the overload characteristics or thermal component of the circuit-breaker and the bottom or straight section represents the short-circuit characteristics or magnetic component.
6. A Fire-fighters' switch must be provided (Regulation group 537.6 and specifically 537.6.1 (i))
7.
 - a. 27A $I_L = P \div (\sqrt{3} \times U_L \times \text{pf})$
 $I_L = 15000 \div (1.732 \times 400 \times 0.8)$
 - b. Type D and 32A nearest rating
8.
 - a. 5 seconds
 - b. 63A
 - c. 315A
 - d. 0.69Ω

Page 48-9 – Electrical distribution and circuit protection devices

1. A 'consumer unit', or 'consumer control unit' or 'electricity control unit'.
2. It will incorporate a manual means of double-pole isolation on the incoming supply
3. The ability of a protective device to operate *before* another protective device in series with the circuit/s it is protecting.
4. The Type B breaker is likely to operate before the BS 88-2, fuse and so the supply will be lost to two circuits rather than just the one with the fault. Change the rating of the Type B breaker to 16A
5.
 - a. An over-current is a current that exceeds the rated current of the circuit or circuits of an electrical installation.
 - b. Overload, short-circuit or earth fault of negligible impedance
6. $I_f = U_o \div Z$ therefore $I_f = 230 \div 0.35 = \underline{657A}$

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7. This is the maximum fault current the circuit breaker can interrupt safely, however the device may no longer be serviceable if this current level is reached.
8.
 - a. The design current is found from: $I_b = P \div (\sqrt{3} \times U_L)$
 $I_b = 50000 \div (\sqrt{3} \times 400)$
 $I_b = \mathbf{72.2A}$
 - b. A Type B circuit breaker will be suitable as this is a resistive, not inductive, load. The current rating available that is 72.2A or above is **80A**
9. RCCB's or RCD's, operate on the 'current balance' principle. If the device operates when in service it will be due to an unbalance of current flow in the line and neutral conductors of the circuit.
10. The supply circuit of a lifting magnet, (*See Regulation 433.3.3*)
11. 100A
12. 60A
13. Approximately 1200sec or 20minutes
14. HRC or HBC fuse to BS88-2 Fuse system E (bolted)
15. Approximately 35 seconds

Page 50-1 – Circuit protection

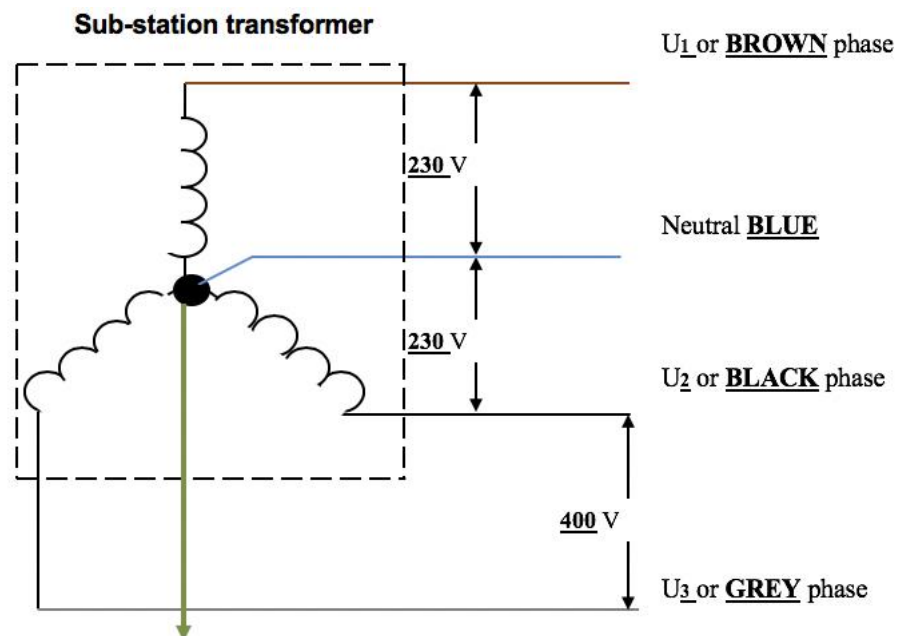
1. D
2. D
3. A
4. C
5. D
6. A
7. B
8. B
9. D
10. A
11. D
12. B
13. D
14. D
15. B

Page 52 – Electric heating

1. C
2. B
3. B
4. D
5. C
6. D
7. C
8. B

Page 53-4 – Distribution and supply systems

1.



- a.
 - b. L1, L2 and L3 rather than U1, U2 and U3 are used to identify individual phases of the supply.
- 2.
- a. Secondary windings
 - b. Phase; phase voltage; U_p ; V_p
 - c. Phases; Line voltage; U_L ; V_L
- 3.
- a. U_p or $V_p = U_L$ or $V_L \div \sqrt{3}$
 - b. $U_p = U_L \div \sqrt{3}$
 $U_p = 400 \div \sqrt{3}$
 $U_p = 230V$

c. $U_p = U_L \div \sqrt{3}$

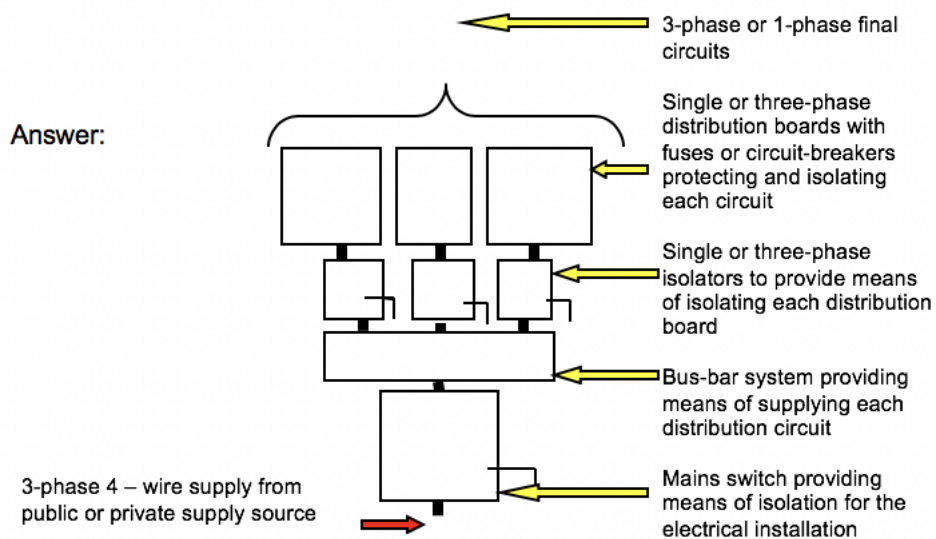
Rearrange the formula so that $U_L = \sqrt{3} \times U_p$

$U_L = \sqrt{3} \times U_p$

$U_L = \sqrt{3} \times 240$

$U_L = 415.68V$

4. Dual voltage distribution is achieved. 230V single-phase and 400V three-phase
- 5.



6.
 - a. A 'fuse-switch' is typically the type of device used at the supply intake position. It provides the means of isolating the installation from the mains supply by disengaging the 3 x main fuses when in the off position.
 - b. A 'switch – fuse' is normally used to provide sub-main or distribution circuit isolation. In this device the fuses or circuit – breakers remain connected on the load side of the switch and isolation is achieved by the operation of a triple-pole switch
7.
 - a. The 'current balance' principle
 - b. To provide automatic disconnection of a circuit in the event of a leakage current to earth

8.
 - a. Isolation device
 - b. On-load isolation device

Page 55-6 – Distribution and supply systems

1. False
2. True
3. True
4. False
5. True
6. False
7. True
8. False
9. True
10. False
11. False
12. True

Page 57 – Wordsearch

A	B	C	O	N	T	A	C	T	O	R	I	O	N	I	Y	F	M	T	H
F	A	R	F	F	H	Y	G	N	I	M	M	I	W	S	L	I	N	K	P
U	E	S	F	R	I	D	S	W	I	T	C	H	N	H	O	R	E	E	L
S	K	U	L	P	X	V	P	K	N	F	C	E	P	O	C	E	X	M	F
E	E	I	J	L	G	Q	A	C	O	T	H	M	E	W	K	F	H	U	O
G	L	D	F	U	N	C	T	I	O	N	A	L	A	E	A	I	I	L	U
E	M	E	R	G	E	N	C	Y	T	R	N	V	E	R	D	G	B	T	N
N	N	V	O	K	D	M	M	O	L	I	I	I	F	N	M	H	I	I	T
U	O	I	N	D	E	G	R	L	I	V	E	M	A	L	I	T	T	P	A
R	Q	C	H	U	C	H	T	A	V	I	A	D	U	T	W	E	I	O	Y
A	R	E	T	T	A	E	O	K	A	R	L	U	L	L	O	R	O	L	N
L	E	A	I	Y	L	O	V	E	R	V	O	L	T	A	G	E	I	E	J
G	S	A	R	B	E	D	L	E	Z	D	N	A	E	V	C	V	A	S	N
R	I	S	O	L	A	T	O	R	X	D	J	T	L	I	N	E	E	W	J
E	D	D	U	U	H	O	O	N	C	R	H	F	W	T	L	P	H	I	I
B	U	S	S	T	C	A	B	R	N	E	B	A	C	K	U	P	W	T	O
M	A	A	D	I	S	C	O	N	N	E	C	T	I	O	N	E	S	C	Q
Y	L	O	H	M	I	A	D	A	F	P	L	F	N	M	A	A	T	H	N
I	H	C	E	E	M	P	R	O	T	E	C	T	I	O	N	C	Y	P	X
P	S	F	T	E	S	V	Y	Q	S	E	B	V	J	U	Y	K	L	E	S