THE OPEN UNIVERSITY OF SRI LANKA
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
HIGHER DIPLOMA IN TECHNOLOGY
ECX4234-ELECTRICAL INSTALLATION
FINAL EXAMINATION - 2014/2015

CLOSED BOOK

Date 9th August 2015 Time: 09.30-12.30 hrs.

This paper contains 8 questions. Pages 5 to 10 contain appropriate tables and characteristic curves required for answering the questions. Answer only five (5) questions.

1. a) What would be the contribution of resistance *under worst operating condition* to the earth fault loop impedance (Z_S) by the resistance of 10 m length 6 mm^2 copper line conductor, if the associated cpc (circuit protective conductor) cable is 1.5 mm^2. **[4 Marks]**

   b) What is the length of a 6 mm^2 copper conductor with a 2.5 mm^2 cpc if the overall contribution of resistance to the earth fault loop impedance *under worst operating condition* is 0.189 Ω **[4 Marks]**

   c) If the total earth fault loop impedance of a particular circuit under *worst operating condition* is 0.96 Ω and the cable is a 20 m length of 4.0 mm^2 copper with a 1.5 mm^2 cpc, what would be the impedance external to the loop. **[4 Marks]**

   d) Will there be a shock risk if a 230 V socket out let fed by a 23 m long 2.5 mm^2 conductor with a 1.5 mm^2 cpc is protected by a 15A, BS3036 semi enclosed removable fuse and the impedance external to the loop is 0.5 Ω **[4 Marks]**

   You may use Table Q1 while answering 1.a) to 1.d)

   Hint: ***The temperature coefficient of Copper*** $\alpha_{20} = 0.004\ \Omega/^0 C$

   The circuit conductor operating temperature when fully loaded for P.V.C. $= 70^0$ C

Table Q1 *Resistance of Copper Conductors at 20 ^{0}C*

Conductor CSA (mm^2)	*Resistance (mΩ/m)*
1.0	*18.1*
1.5	*12.1*
2.5	*7.41*
4.0	*4.61*
6.0	*3.08*

   e) Specify the conditions that should be maintained between:
   - Design load current **(I_b)**
   - Nominal current or setting of the protective device **(I_n)**
   - Rating of the circuit conductor **(I_z)**
   - Current causing effective operation of the protective device **(I_2)**

   For the protection of a wiring circuit against overloading using following devices:

   i) HBC/HRC fuses to BS 88-2.2 & BS88-6 & mcbs to BS EN 60898 **[2 Marks]**

   ii) Semi-enclosed ceramic fuses to BS3036 **[2 Marks]**

2. The owner of a small hotel is requesting a power supply from 3 phase 400V, 50 Hz system. The electrical wiring of the hotel consists of the following appliances:

   - 12 Nos. of 60W fluorescent lamps each controlled by a switch
   - 10 Nos. of 100W incandescent lamps each controlled by a switch
   - 4 Nos. of single phase motor driven appliances such as mixers, grinders etc. each rated at 0.8 kW with a power factor of 0.85 lagging.
   - 2 Nos. of single phase water pump rated at 1.5 kVA with a p.f. 0.8 lagging
   - 3 Nos. of air-conditioners consuming 16 A at 0.85 lagging on full load.
   - 2 Nos. of ring circuits each of capacity 30 A to cater for unspecified number of appliances.
   - One television consuming 200 W
   - 2 Nos. of 2.5 kW instantaneous type water heaters

   a) Determine the maximum demand for the above hotel **[16 marks]**

   b) What type of a service would you recommends for the above shop and determines the size of the service cable (main wire)? **[4 Marks]**

3. A single phase 230 V, electric appliance rated at 2 kW is to be fed from a distribution board over a distance of 8 m with 2 bends. The PVC insulated copper (thermo plastic, **multi-core**) cable recommended for this installation is enclosed in a conduit with 3 other similar size cable circuits embedded in a plastered brick work. The ambient temperature is 33 ^{0}C.

   a) Determine the design current for the appliance **(I_b)** **[2 Marks]**

   b) Select, raring of the device if it is to be protected by BS 88 fuse **(I_n)** **[2 Marks]**

   c) Calculate the value **C_a** for computing the cable rating **[2 Marks]**

   d) What is the suitable value of **C_g** for computing the cable rating **[2 Marks]**

   e) Compute the required ampere rating of this cable **[3 Marks]**

   f) What should be its cross sectional area **[2 Marks]**

   g) What voltage would you experience at the appliance **[3 Marks]**

   h) What diameter would you recommend for the conduit if the laying incorporates two bends **[2 Marks]**

   i) Calculate the minimum value for bending radius **[2 Marks]**

4. **a)** Explain with a sketch, the method of "system earthing" used in Sri Lanka? **[4 Marks]**

   b) Show the components of a typical earth fault loop path in the form of a simple circuit clearly defining all the components appearing in the circuit and write an expression for the earth loop impedance Z_S? **[4 Marks]**

   c) State briefly, the differences between MCB, RCCB and RCBO with respect to their operational characteristics? **[4 Marks]**

   d) In the equation $t = \frac{k^2 \times S^2}{I^2}$, based on what factors the value k depends? **[4 Marks]**

e) Name the instrument you used to measure the insulation resistance of a domestic electrical installation, what voltage would you apply if the installation is wired for 230 V ac and state the value of the insulation resistance you would expect from an acceptable electrical installation as per the IEE Regulations? **[4 Marks]**

5. A certain electric appliance operating at 230 V, 50 Hz supply rated at 3.5 kW is to be installed using single core p.v.c. insulated copper conductors with 2.5 mm^2 circuit protective conductor (c.p.c).

a) What would be the appropriate protective device rating if it is to be protected by Type B RCBO to BSEN61009-1? **[5 Marks]**

b) If the ambient temperature is 35^0C and the circuit is running in an enclosed circuit embedded in a wall (not thermally insulated) with another similar circuit for about 30 m, calculate the suitable cable size for this installation. **[5 Marks]**

c) If the earth fault loop impedance external to the circuit is 1.5 Ω, check whether the circuit is satisfying the adiabatic equation. (Assume k=115 for Copper) **[5 Marks]**

d) Compute the maximum time duration the conductor can withstand as per the adiabatic equation if one wish to introduce a time delay switch for the protective device. **[5 Marks]**

6. Conceptual single line diagram of a certain installation is as shown in Figure Q6.

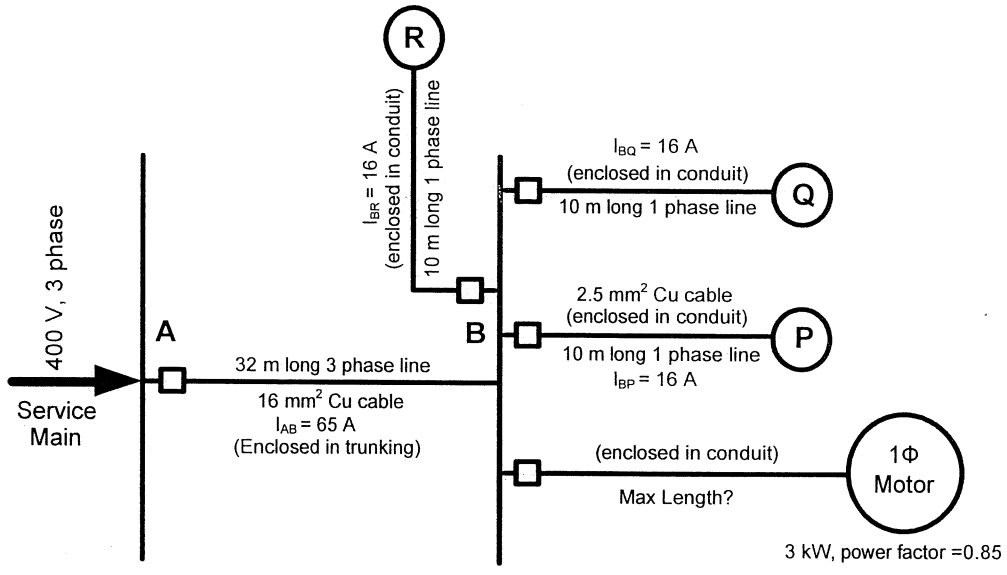


Figure Q6

a) A 3 phase service main of 16 mm^2 and a length of 32 m caries a current of 65 A. The above three phase line supplies 3 single phase individual identical appliances P, Q & R as shown in the figure. What would be the percentage voltage drop at the end of a circuit? **[10 Marks]**

b) Calculate the Maximum distance of the cable that can be allowed for the installation of a single phase induction motor as shown above if the total permissible voltage drop allowed from A to the motor *(Service main is 400 V, 3phase)* is 2.5%? **[10 Marks]**

7. Figure Q7 shows three metal conduits joined to a section of metal trunking in an industrial electrical installation.

Determine:
- **a)** An appropriate size for the main trunking system A ⟶ B **[3 Marks]**
- **b)** The size of the conduit for Load L1 **[3 Marks]**
- **c)** Conduit bending radius R_1 **[2 Marks]**
- **d)** The size for trunking system B ⟶ C (AB to BC should be compatible) **[2 Marks]**
- **e)** The number of 6 mm^2 cables in conduit for Load L2 **[3 Marks]**
- **f)** Conduit bending radius R_2 **[2 Marks]**
- **g)** The size for trunking system C ⟶ D (BC to CD should be compatible) **[2 Marks]**
- **h)** The size of the conduit for Load L3 **[3 Marks]**

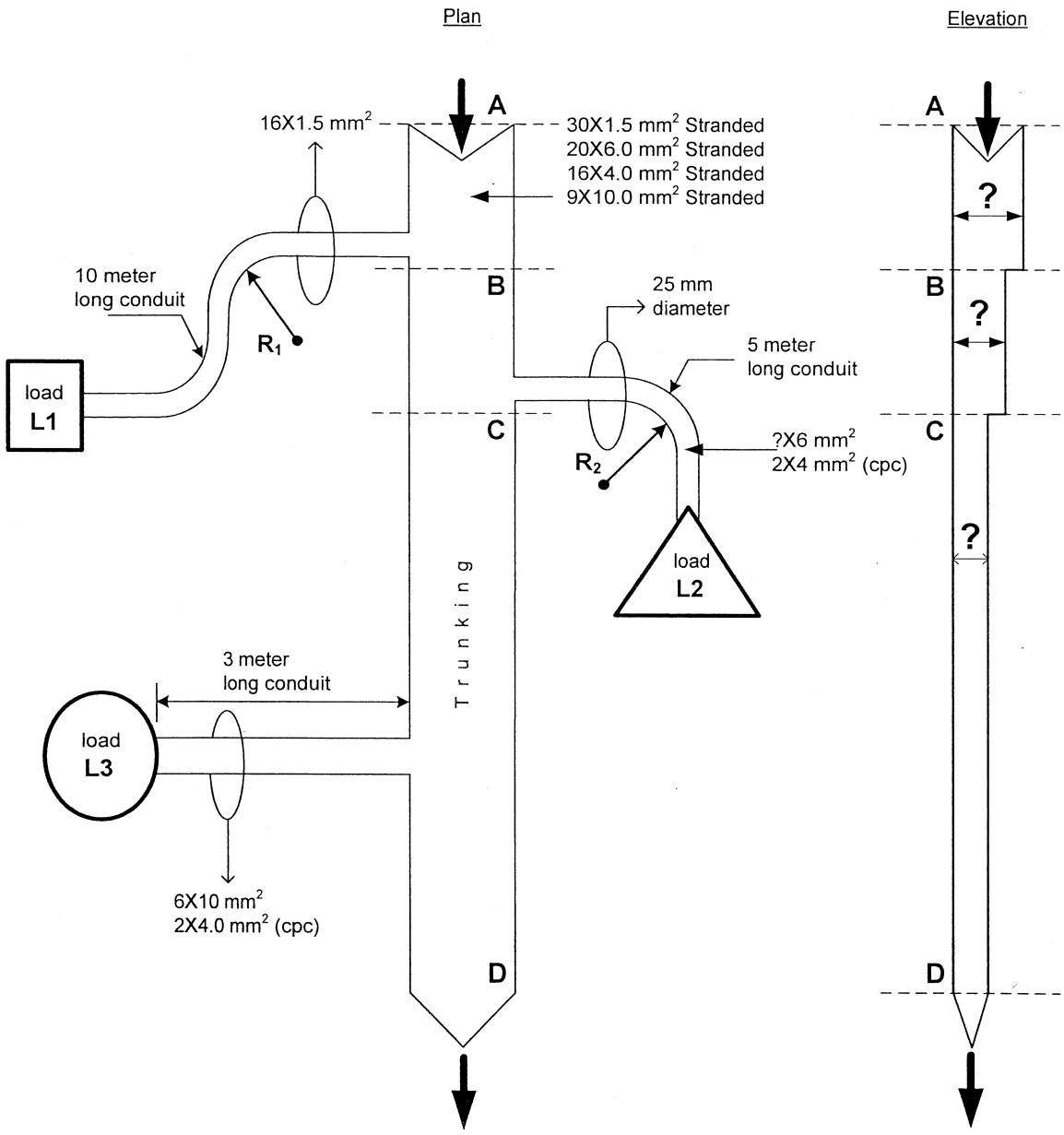


Figure Q7

8. a) Prove that the resistance R of (l m long & area A m^2) a rod electrode driven in to earth of soil resistivity $\rho\,\Omega$m is given by $R = \frac{\rho}{4.\pi.l}\ln\left(\frac{\pi}{A}\right)$. **[5 Marks]**

b) What would be the theoretical earth resistance of a 2.5m long GI pipe of diameter 60 mm firmly driven in to a location with a soil resistivity of 100 Ωm. **[5 Marks]**

c) State three methods that can be adopted to improve earth electrode resistance. **[5 Marks]**

d) How many earth electrodes of (b) above you need and how would you connect those electrodes to reduce the earth resistance of the premise to 5Ω? **[5 Marks]**

Diversity factor table for Q2

Purpose of final circuit fed from conductors or switchgear to which diversity applies	Type of premises		
	Individual household installations, including individual dwelling of a block	Small shops, stores, offices and business premises	Small hotels, boarding houses, guest houses, etc.
1. Lighting	66% of total current demand	90% of total current demand	75% of total current demand
2. Heating and power	100% of total current demand up to 10 A + 50% of any current demand in excess of 10 A.	100% f.l. of largest + 75% of f.l. of remaining appliances.	100% f.l. of largest + 80% f.l. of 2nd largest + 60% f.l. of remaining appliances.
3. Cooking appliances	10 A + 30% f.l. of connected cooking appliances in excess of 10 A + 5 A if socket outlet incorporated in unit.	100% f.l. of largest + 80% f.l. of 2nd largest + 60% f.l. of remaining appliances.	
4. Motors (other than lift motors which are subject to special consideration)		100% f.l. of largest + 80% f.l. of 2nd largest + 60% f.l. of remaining motors.	100% f.l. of largest + 50% f.l. of remaining motors
5. Water-heaters (instantaneous type)	100% f.l. of largest + 100% f.l. of 2nd largest + 25% f.l. of remaining appliances		
6. Water-heaters (thermostatically controlled)	No diversity allowable		
7. Floor warming installations	No diversity allowable		
8. Thermal storage space heating installations	No diversity allowable†		
9. Water pumps	100% f.l. of the largest pump motor and 25% of the remaining		
10. Standard arrangements of final circuits	100% of current demand of largest circuit + 40% of current demand of every other circuit	100% of current demand of largest circuit + 50% of current demand of every other circuit	
11. Socket outlets other than those included in 9 above and stationary equipment other than those listed above (e.g. Air conditioners)	100% of current demand of largest point of utilisation + 40% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation + 75% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation + 75% of current demand of every point in main rooms (dining rooms, etc) + 40% of current demand of every other point of utilisation

Values of (R_1+R_2) per meter for P.V.C. insulated copper conductors

Cross sectional area mm^2		(R_1+R_2) Ohms/meter
Phase conductor	Protective conductor	
1	1	0.055
1.5	1	0.046
	1.5	0.037
2.5	1	0.039
	1.5	0.03
	2.5	0.022
4	1.5	0.026
	2.5	0.018
	4	0.014
6	2.5	0.016
	4	0.0116
	6	0.0092

Cross sectional area mm^2		(R_1+R_2) Ohms/meter
Phase conductor	Protective conductor	
10	2.5	0.01375
	4	0.0098
	6	0.0074
	10	0.0055
16	2.5	0.01275
	4	0.00875
	6	0.0064
	10	0.0045
	16	0.0035

Rating factor (C_a) table for ambient temperature correction

Ambient Temp. ^{0}C	Insulation 70 ^{0}C thermoplastic	Insulation 90 ^{0}C thermosetting
25	1.03	1.02
30	1.00	1.00
35	0.94	0.96
40	0.87	0.91
45	0.79	0.87
50	0.71	0.82
55	0.61	0.76
60	0.50	0.71

Rating factor (Cg) table for one circuit or for a group of circuits

Arrangement of cables (touching)	Number of circuits or multicore cables												Laying Methods Reference
	1	2	3	4	5	6	7	8	9	12	16	20	
Bunched in air, on a surface, embedded or enclosed	1.00	0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.45	0.41	0.38	Methods A to F
Single layer on wall or floor	1.00	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	0.70	0.70	0.70	Method C
Single layer multicore on a perforated horizontal or vertical cable tray system	1.00	0.88	0.82	0.77	0.75	0.73	0.72	0.72	0.72	0.72	0.72	0.72	Methods E & F
Single layer multicore on cable ladder system or cleats.	1.00	0.87	0.82	0.80	0.80	0.79	0.79	0.78	0.78	0.78	0.78	0.78	

Table 4D1A – Single-core 70°C thermoplastic insulated cables, non-armoured, with or without sheath (COPPER CONDUCTORS)

Ambient temperature: 30 °C

CURRENT-CARYING CAPACITY (amperes): **Conductor operating temperature: 70 °C**

Conductor Cross Sectional area	Reference Method A (Enclosed in conduit in thermally insulating wall etc.)		Reference Method B (Enclosed in conduit on a wall or in trunking etc.)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray horizontal or vertical)				
	2 cables. 1Φ a.c. or d.c.	3 or 4 cables. 3Φ a.c.	2 cables. 1Φ a.c. or d.c.	3 or 4 cables. 3Φ a.c.	2 cables. 1Φ a.c. or d.c. flat & touching	3 or 4 cables. 3Φ a.c. flat & touching or trefoil	Touching			Spaced by one diameter	
							2 cables. 1Φ a.c. or d.c. flat	3 cables. 3Φ a.c. flat	3 cables. 3Φ a.c. trefoil	2 cables, 1Φ a.c. or d.c. or 3 cables 3Φ a.c. flat	
										Horizontal	Vertical
mm^2	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.
1	11	10.5	13.5	12	15.5	14	-	-	-	-	-
1.5	14.5	13.5	17.5	15.5	20	18	-	-	-	-	-
2.5	20	18	24	21	27	25	-	-	-	-	-
4	26	24	32	28	37	33	-	-	-	-	-
6	34	31	41	36	47	43	-	-	-	-	-
10	46	42	57	50	65	59	-	-	-	-	-
16	61	56	76	68	87	79	-	-	-	-	-
25	80	73	101	89	114	104	131	114	110	146	130
35	99	89	125	110	141	129	162	143	137	181	162
50	119	108	151	134	182	167	196	174	167	219	197
70	151	136	192	171	234	214	251	225	216	281	254
95	182	164	232	207	284	261	304	275	264	341	311
120	210	188	269	239	330	303	352	321	308	396	362
150	240	216	300	262	381	349	406	372	356	456	419
185	273	245	341	296	436	400	463	427	409	521	480
240	321	286	400	346	515	472	546	507	485	615	569
300	367	328	458	394	594	545	629	587	561	709	659

Table 4D1B – Single-core 70°C thermoplastic insulated cables, non-armoured, with or without sheath (COPPER CONDUCTORS)

VOLTAGE DROP (per ampere per meter): **Conductor operating temperature: 70 °C**

Conductor Cross Sectional area	2 cables 1Φ a.c.			3 or 4 cables, 3 Φ a.c.		
	Reference Methods A & B (Enclosed in conduit or trunking)	Reference Methods C & F (clipped direct, on tray or in free air)		Reference Methods A & B (Enclosed in conduit or trunking)	Reference Methods C & F (clipped direct, on tray or in free air)	
		Cables touching	Cables spaced		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
mm^2	mV/Amp/meter	mV/Amp/meter	mV/Amp/meter	mV/Amp/meter	mV/Amp/meter	mV/Amp/meter	mV/Amp/meter
1	44	44	44	38	38	38	38
1.5	29	29	29	25	25	25	25
2.5	18	18	18	15	15	15	15
4	11	11	11	9.5	9.5	9.5	9.5
6	7.3	7.3	7.3	6.4	6.4	6.4	6.4
10	4.4	4.4	4.4	3.8	3.8	3.8	3.8
16	2.8	2.8	2.8	2.4	2.4	2.4	2.4

	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.80	0.33	1.80	1.75	0.20	1.75	1.75	0.29	1.80	1.50	0.29	1.55	1.50	0.175	1.50	1.50	0.25	1.55	1.50	0.32	1.55
35	1.30	0.31	1.30	1.25	0.195	1.25	1.25	0.28	1.30	1.10	0.27	1.10	1.10	0.170	1.10	1.10	0.24	1.10	1.10	0.32	1.15
50	0.95	0.30	1.00	0.93	0.190	0.95	0.93	0.28	0.97	0.81	0.26	0.85	0.80	0.165	0.82	0.80	0.24	0.84	0.80	0.32	0.85
70	0.65	0.29	0.72	0.63	0.185	0.66	0.63	0.27	0.69	0.56	0.25	0.61	0.55	0.160	0.57	0.55	0.24	0.60	0.55	0.31	0.63
95	0.49	0.28	0.56	0.47	0.180	0.50	0.47	0.27	0.54	0.42	0.24	0.48	0.41	0.155	0.43	0.41	0.23	0.47	0.40	0.31	0.51
120	0.39	0.27	0.47	0.37	0.175	0.41	0.37	0.26	0.45	0.33	0.23	0.41	0.32	0.15	0.36	0.32	0.23	0.40	0.32	0.30	0.44
150	0.31	0.27	0.41	0.30	0.175	0.34	0.29	0.26	0.39	0.27	0.23	0.36	0.26	0.15	0.30	0.26	0.23	0.34	0.26	0.30	0.40
185	0.25	0.27	0.37	0.24	0.170	0.29	0.24	0.26	0.35	0.22	0.23	0.32	0.21	0.145	0.26	0.21	0.22	0.31	0.21	0.30	0.36
240	0.195	0.26	0.33	0.185	0.165	0.25	0.185	0.25	0.31	0.17	0.23	0.29	0.16	0.145	0.22	0.16	0.22	0.27	0.16	0.29	0.34
300	0.160	0.26	0.31	0.150	0.165	0.22	0.150	0.25	0.29	0.14	0.23	0.27	0.13	0.14	0.19	0.13	0.22	0.25	0.13	0.29	0.32

1Φ – Single phase; 3Φ – Three phases;

Note: * - Spacing larger than one cable diameter will result in a larger voltage drop.

Source: IEE wiring Regulations 17th edition

Table 4D2A – Multi-core 70^{0}C thermoplastic insulated and thermo plastic sheathed cables, non-armoured

(COPPER CONDUCTORS)

Ambient temperature: 30 ^{0}C

CURRENT-CARYING CAPACITY (amperes): **Conductor operating temperature: 70 ^{0}C**

Conductor Cross Sectional area	Reference Method A (Enclosed in conduit in thermally insulating wall etc.)		Reference Method B (Enclosed in conduit on a wall or in trunking etc.)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray etc. horizontal or vertical)	
	1 two-core cable*. 1Φ a.c. or d.c.	1 three-core cable* or 1 Four-core cable, 3Φ a.c.	1 two-core cable*. 1Φ a.c. or d.c.	1 three-core cable* or 1 Four-core cable, 3Φ a.c.	1 two-core cable*. 1Φ a.c. or d.c.	1 three-core cable* or 1 Four-core Cable, 3Φ a.c.	1 two-core cable*. 1Φ a.c. or d.c.	1 three-core cable* or 1 Four-core Cable, 3Φ a.c.
mm^2	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.	Amps.
1	11	10	13	11.5	15	13.5	17	14.5
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34
6	32	29	38	34	46	41	51	43
10	43	39	52	46	63	57	70	60
16	57	52	69	62	85	76	94	80
25	75	68	90	80	112	96	119	101
35	92	83	111	99	138	119	148	126
50	110	99	133	118	168	144	180	153
70	139	125	168	149	213	184	232	196
95	167	150	201	179	258	223	282	238
120	192	172	232	206	299	259	328	276
150	219	196	258	225	344	299	379	319
185	248	223	294	255	392	341	434	364
240	291	261	344	297	461	403	514	430
300	334	298	394	339	530	464	593	497
400	-	-	470	402	634	557	715	597

* With or without a protective conductor

1Φ – Single phase; 3Φ – Three phases

Table 4D2B – Single-core 70^{0}c thermoplastic insulated cables, non-armoured, with or without sheath

(COPPER CONDUCTORS)

VOLTAGE DROP (per ampere per meter): Conductor operating temperature: 70 ^{0}C

Conductor Cross Sectional area	Two-core Cable. d.c.	Two-core cable. Single-phase a.c.			Three or Four-core cable. Three phase a.c.		
mm^2	mV/Amp/meter	mV/Amp/meter			mV/Amp/meter		
1	44	44			38		
1.5	29	29			25		
2.5	18	18			15		
4	11	11			9.5		
6	7.3	7.3			6.4		
10	4.4	4.4			3.8		
16	2.8	2.8			2.4		
		r	x	z	r	x	z
25	1.75	1.75	0.170	1.75	1.50	0.145	1.50
35	1.25	1.25	0.165	1.25	1.10	0.145	1.10
50	0.93	0.93	0.165	0.94	0.80	0.140	0.81
70	0.63	0.63	0.160	0.65	0.55	0.140	0.57
95	0.46	0.47	0.155	0.50	0.41	0.135	0.43
120	0.36	0.38	0.155	0.41	0.33	0.135	0.35
150	0.29	0.30	0.155	0.34	0.26	0.130	0.29
185	0.23	0.25	0.150	0.29	0.21	0.130	0.25
240	0.180	0.190	0.155	0.24	0.165	0.130	0.21
300	0.145	0.155	0.145	0.21	0.135	0.130	0.185
400	0.105	0.115	0.145	0.185	0.100	0.125	0.160

Source: IEE wiring Regulations 17th edition

FACTORS FOR CONDUITS

Cable Factors for straight runs ≤ 3 m

Type of conductor	Conductor cross-sectional area mm^2	Factor
Solid	1	22
	1.5	27
	2.5	39
Stranded	1.5	31
	2.5	43
	4	58
	6	88
	10	146

Conduit factors for straight runs ≤ 3 m

Conduit diameter (mm)	Factor
16	290
20	460
25	800
32	1400

Cable factors for long straight runs > 3 m or runs incorporating bends

Type of conductor	Conductor cross-sectional area mm^2	Factor
Solid or stranded	1	16
	1.5	22
	2.5	30
	4	43
	6	58
	10	105

Conduit factors for runs incorporating bends

Length Of run (m)	Conduit diameter, mm																			
	16	20	25	32	16	20	25	32	16	20	25	32	16	20	25	32	16	20	25	32
	Straight				One bend				Two bends				Three bends				Four bends			
1	290	460	800	1400	188	303	543	947	177	286	514	900	158	256	463	818	130	213	388	692
1.5	290	460	800	1400	182	294	528	923	167	270	487	857	143	233	422	750	111	182	333	600
2	290	460	800	1400	177	286	514	900	158	256	463	818	130	213	388	692	97	159	292	529
2.5	290	460	800	1400	171	278	500	878	150	244	442	783	120	196	358	643	86	141	260	474
3	290	460	800	1400	167	270	487	857	143	233	422	750	111	182	333	600				
3.5	179	290	521	911	162	263	475	837	136	222	404	720	103	169	311	563				
4	177	286	514	900	158	256	463	818	130	213	388	692	97	159	292	529				
4.5	174	282	507	889	154	250	452	800	125	204	373	667	91	149	275	500				
5	171	278	500	878	150	244	442	783	120	196	358	643	86	141	260	474				
6	167	270	487	857	143	233	422	750	111	182	333	600								
7	162	263	475	837	136	222	404	720	103	169	311	563								
8	158	256	463	818	130	213	388	692	97	159	292	529								
9	154	250	452	800	125	204	373	667	91	149	275	500								
10	150	244	442	783	120	196	358	643	86	141	260	474								

Source: IEE wiring Regulations 15th edition

FACTORS FOR TRUNKING

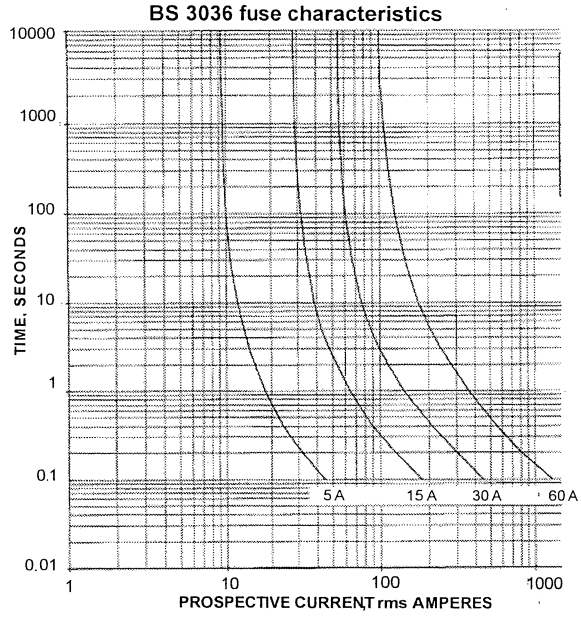
Cable factors for Tunking

Type of conductor	Conductor cross-sectional area mm^2	Factor
Solid	1	7.1
	2.5	10.2
Stranded	1.5	8.1
	2.5	11.4
	4	15.2
	6	22.9
	10	36.3

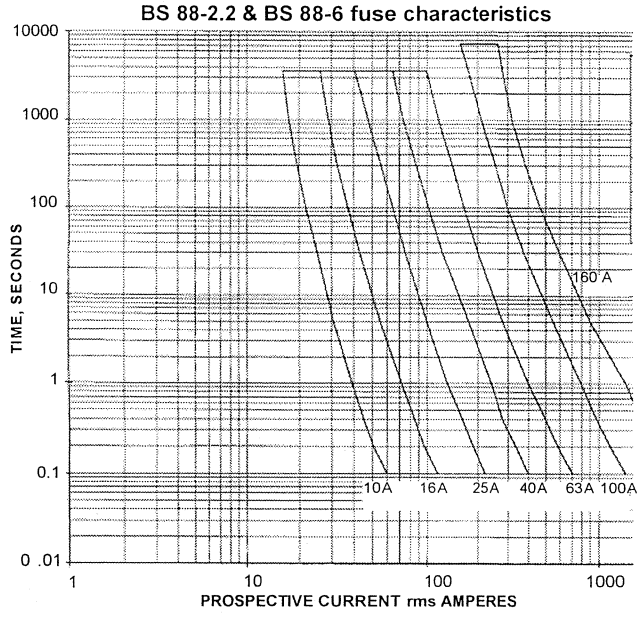
Factor for Trunking

Dimension of trunking (mm x mm)	Factor	Dimension of trunking (mm x mm)	Factor
50 x 37.5	767	100 x 37.5	1542
50 x 50	1037	100 x 50	2091
75 x 25	738	100 x 75	3189
75 x 37.5	1146	100 x 100	4252
75 x 50	1555		
75 x 75	2371		
100 x 25	993		

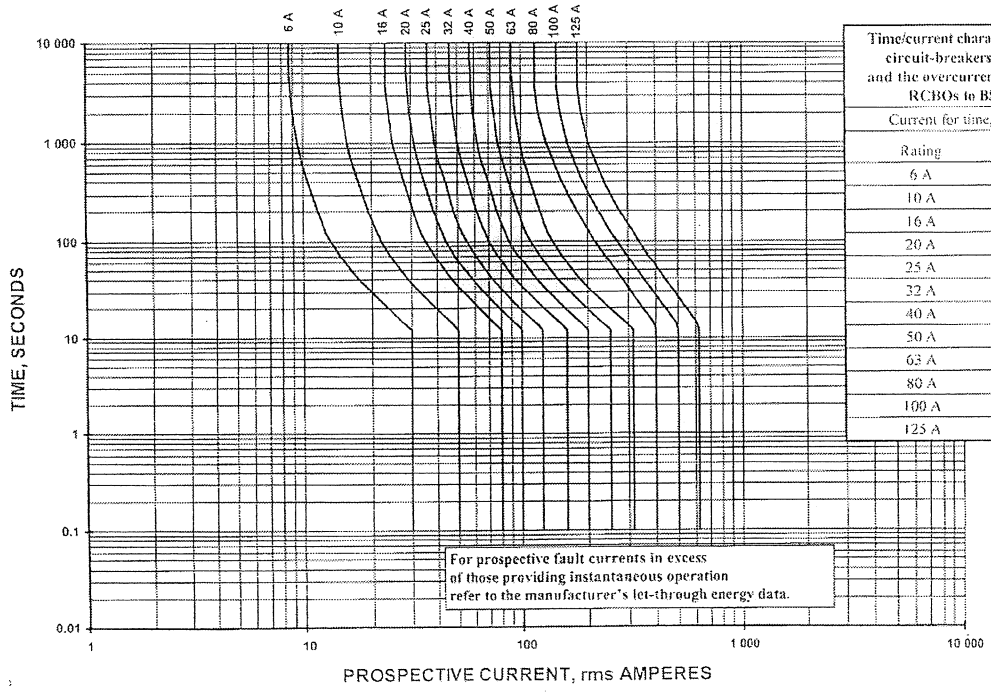
BS 3036 fuse characteristics



BS 88-2.2 & BS 88-6 fuse characteristics



Type B circuit-breaker to BS EN 60898 and RCBOs to BS EN 61009-1 characteristics



Time/current characteristics for Type B circuit-breakers to BS EN 60898 and the overcurrent characteristics of RCBOs to BS EN 61009-1

Current for time, 0.1 sec to 5 secs

Rating	Current
6 A	30 A
10 A	50 A
16 A	80 A
20 A	100 A
25 A	125 A
32 A	160 A
40 A	200 A
50 A	250 A
63 A	315 A
80 A	400 A
100 A	500 A
125 A	625 A