

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year Special Backlog Examination, 2022

Course No: CE 3225 Course Title: Structure IV

Full Marks: 210

Time: 03 Hours

- N.B. i) Answer any three questions from each section in separate script
ii) Figures in the right margin indicate full marks

Section-A



1. Design an interior flat plate having C/C span length of 16ft in both directions. 35
The plate is supported on square columns of dimension 14in. x 14in. and height of 10ft. Assume a service live load of 85psf and a service dead load of 125psf (including self-weight), $f_c' = 3500psi$ and $f_y = 60000psi$. Given that percentage of interior negative design moments to be resisted by column strip is 75% and percentages of positive design moment to be resisted by middle strip is 40%. Also draw reinforcement detailing.
2. a) Briefly describe different types of columns. 10
b) Design a circular spiral reinforced column for concentric allowable working load of 480kips with $f_c' = 4ksi$ and $f_y = 60ksi$ for both longitudinal steel and spiral. Show the reinforcement detailing. Assume, steel ratio is 2%. 25
3. a) Differentiate between flat plate and flat slab. Write down the advantages and disadvantages of flat plate over conventional RCC frame. 15
b) What are the limitations of direct design method? 10
c) Show the distribution of moments in slab (end span and interior span) with their plan view and loading. 10
4. a) Explain the interaction diagram for column with neat sketch. 10
b) Why shear reinforcement is placed at a distance 'd' from the face of the support? 10
c) A column with the cross-section shown in Figure is loaded concentrically. 15
Calculate the allowable axial load. Given $f_c' = 4ksi$ and $f_y = 60ksi$.

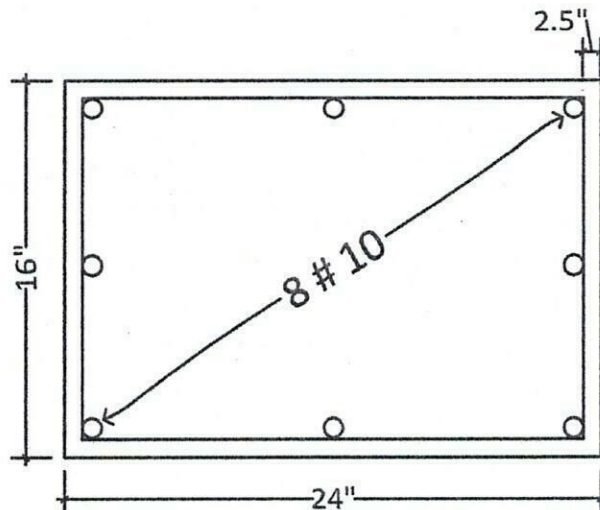


Fig 4(C)

Section-B

5. a) What is shear wall? Show different types of shear wall with neat sketches. 12
- b) What are the benefits of providing shear wall in a building? 10
- c) Draw the seismic zones of Bangladesh & show the zone coefficients. 13

6. Shear wall layout for a building with the unfactored lateral seismic load acting on the building is given below. Design the shear wall for the seismic loads. Given $f'_c=3500psi$ and $f_y=60000psi$. 35

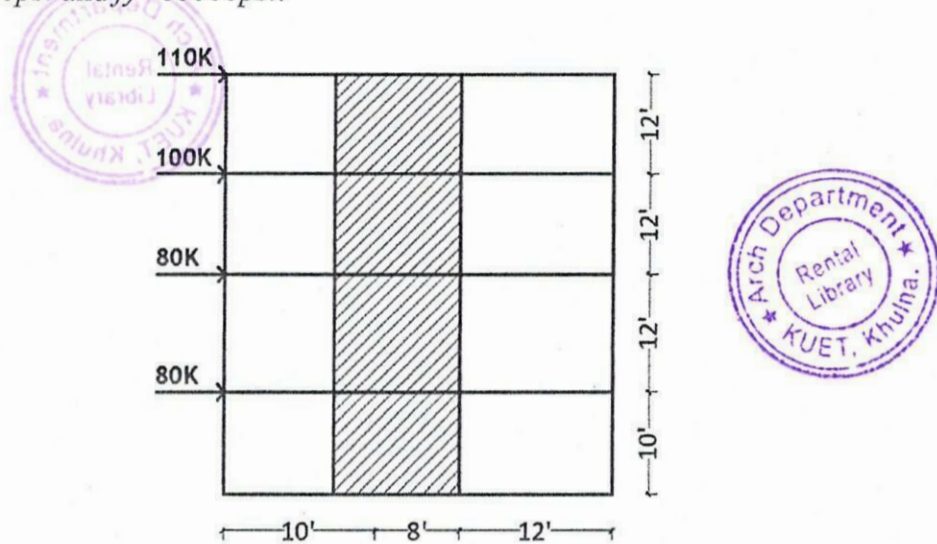
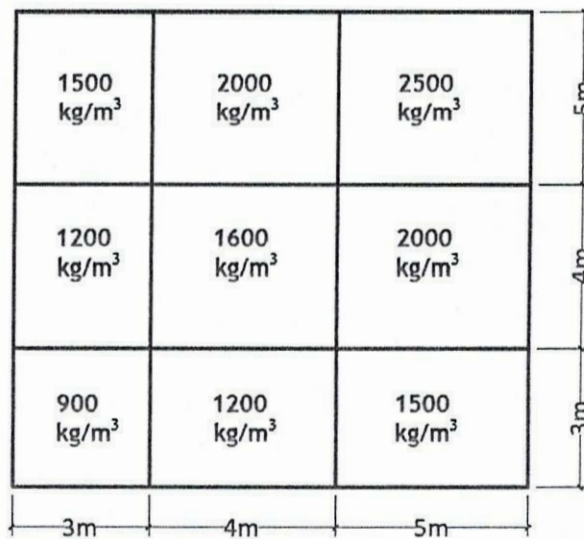


Figure (6)

7. a) What are the causes & effects of earthquake? 12
- b) What are the different techniques for designing earthquake resisting structures? Describe base isolation techniques with neat sketches. 13
- c) What are the benefits of using diagrid structural system? 10

8. The plan of a simple one-story building having non-uniform distribution of mass is shown below. The rigidity of the columns are given in the Figure below. Determine the location of center of mass and center of stiffness. Also determine the eccentricity. 35



Thickness of slab = 200mm

Figure (8)

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year Special Backlog Examination, 2022

Course No: CE 3125 Course Title: Structure III: Reinforced Concrete Design

Full Marks: 210

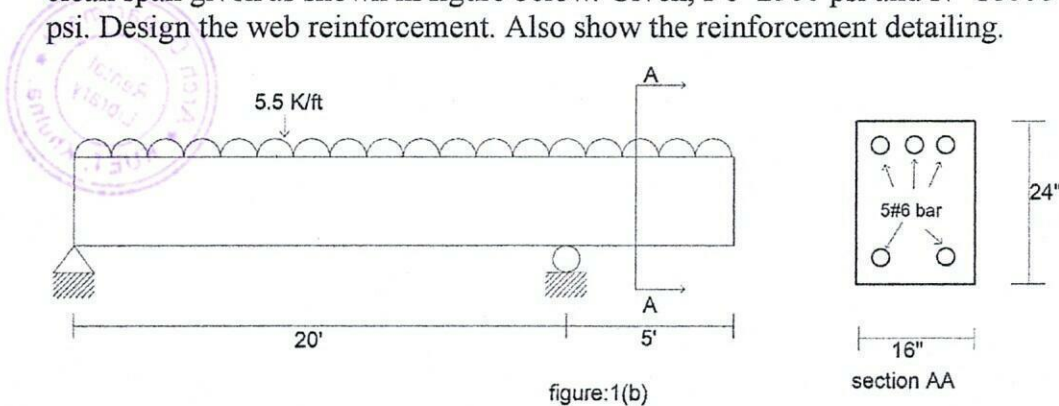
Time: 03 Hours

- N.B i) Answer any three questions from each section in separate script
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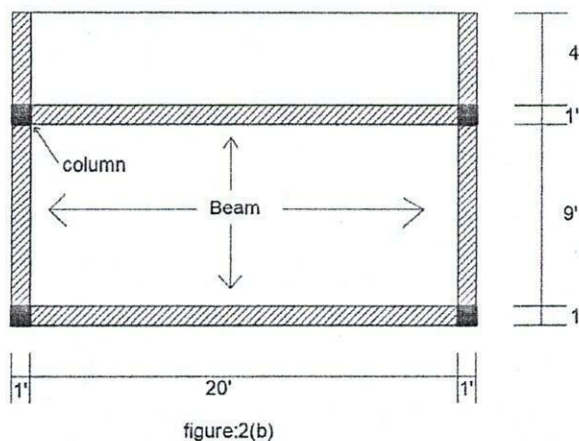


Section-A

1. a) Why is reinforcement provided at the tension zone of the reinforced concrete structures? Explain with suitable figure. 10
- b) An overhanging rectangular beam having a width of 16" and effective depth of 24" carries a total working load of 5.5k/ft in addition to its self-weight on a 20ft clean span given as shown in figure below. Given, $f'_c=2500$ psi and $f_v=18000$ psi. Design the web reinforcement. Also show the reinforcement detailing. 25

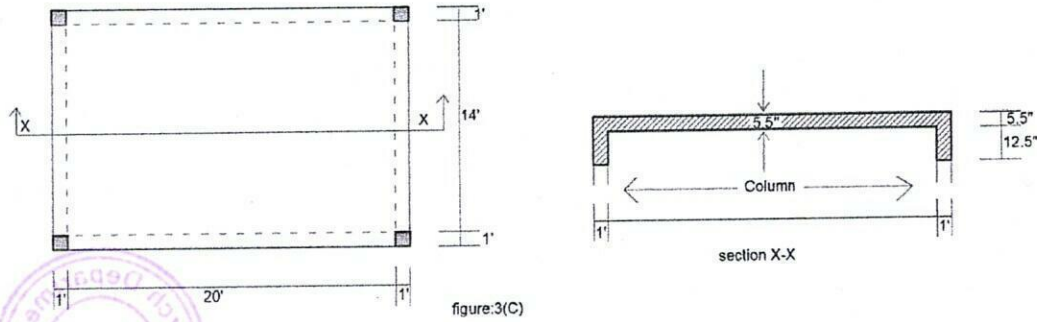


2. a) Why is the critical shear considers at a distance of 'd' from the face of the support? 08
- b) A slab show in figure carries a live load of 80psf and its self-weight. The position of beam and column is shown below. Given, $f'_c=3500$ psi and $f_y=60000$ psi. Design the slab and show the reinforcement detailing with neat sketch. 27



3. a) Why shear failure in reinforced concrete structure is more devastating compared to the flexural failure? 10
- b) What is corner reinforcement? Why is it provided? What are the design guidelines for corner reinforcement? 10
- c) A 22'X16' slab as shown in figure has a thickness of 5.5" and carrying a live load of 60psf in addition to its self-weight. The beam supporting the slab has a width of 12" and depth of 18". The column supporting the beam has a 15

dimension of 12"x12". Determine the factored design load in beams and columns of the structure.



4. a) Design an interior panel of a two way slab floor system with four ends continuous having panel of 16'x21' supported on beams having width of 12". The service live load is taken to be 100psf and the service dead load consists of 25psf floor finish in addition to the self-weight of the slab. Use $f'c=2500$ psi and $f_y=60$ Ksi and the following coefficients are given below. Draw the reinforcement detailing of both longitudinal and transverse section of the slab.
- | | | |
|--------------------|---------------------------------|---------------------------------|
| $C_{a(-ve)}=0.069$ | $C_{a(\text{dead load})}=0.028$ | $C_{a(\text{live load})}=0.045$ |
| $C_{b(-ve)}=0.022$ | $C_{b(\text{dead load})}=0.009$ | $C_{b(\text{live load})}=0.014$ |

Section-B

5. a) Explain the behavior of a reinforced concrete beam at failure. 15
- b) A reinforced concrete beam was tested to failure and had a rectangular section with $b=12$ in. and $d=18.5$ in. At failure moment, the strain in the tension steel was recorded as 0.004108. If $f'c=5000$ psi and $f_y=60$ Ksi.
- Check if the tension steel has yielded.
 - Calculate the steel area provided in the section to develop the above strain. Then calculate the applied moment.
6. a) A rectangular beam has a width of 12in. and an effective depth of 20in. It is reinforced with three nos. 10 bars in one row. Assume, $f'c=4000$ psi and $f_y=60000$ psi. What is the maximum working moment that can be resisted? 12
- b) A singly reinforced rectangular beam is to be designed to carry a service live load of 1.5 k/ft in addition to its own weight on a 6ft cantilever beam. Assume, $f'c=4000$ psi and $f_y=60000$ psi. Determine the concrete dimensions and steel reinforcement bars. 23
7. a) What is meant by i) Under reinforced ii) Over reinforced iii) Balanced design? What type of design is preferable and why? 10
- b) A rectangular beam which must carry a working live load of 2K/ft and a calculated dead load of 1.5K/ft on a 20ft simple span is limited in cross-section for architectural reasons to 10in. width and 15in. in total depth. Design and detail the beam by strength design method. Use $f'c=4000$ psi and $f_y=60000$ psi. 25
8. a) A concrete floor system consists of parallel T-beams spaced at 10ft on centers and spanning over 30ft between supports. The 5in. thick slab is casted monolithically with T-beams webs having width of 14in. and total depth of 28in. The T-beam must carry a superimposed dead load of 50 psf and a service live load of 220 psf. Assume, $f'c=4000$ psi and $f_y=60000$ psi. Determine the required tensile steel area with neat sketch using USD method. 35

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year Special Backlog Examination, 2022

Course No: Arch 3231 Course Title: Contemporary Architecture

Full Marks: 210

Time: 03 Hours

- N.B. . i) Answer any three questions from each section in separate script
ii) Figures in the right margin indicate full marks

Section-A



1. a) The demolition of which project symbolized the death of modern architecture, and why? 10
b) Briefly describe the significant causes behind the rise of modern architecture. 25
2. a) What is deconstructivism? 10
b) Elucidate the visual traits of contemporary architecture with reference to built projects. 25
3. a) What are the advantages and disadvantages of following styles in architecture? 10
b) Which modern architect do you think embraces a more human-centered philosophy compared to the often-radical approaches of their peers? Explain in favour of your answer. 25
4. a) Name the New York Five, and mention few of their design traits. 10
b) Rationalize the statement that the works of Daniel Libeskind thoughtfully deconstruct and reinterpret the historical essence of our existence. 25

Section-B

5. a) What factors would you think are significant behind the development of contemporary architecture, explain briefly. 20
b) Discuss "The Pluralistic Thought in Architecture" with example. 15
6. a) Illustrate the philosophy 'Vernacularism in Architecture' with necessary examples. 15
b) "Form follows climate", discuss the statement with the works of architect 'Charles Correa'. 20
7. a) Elaborate the ideology 'Regionalism' with reference of two works of architect Muzharul Islam. 20
b) How political and cultural factors affect the development of architecture in Bangladesh, discuss briefly. 15
8. a) The works of architect Geoffrey Bawa represent the tropical modernism of Sri-Lanka, illustrate with examples. 20
b) How would you define 'Identity in architecture'. Explain with the factors spatial organization and semantic organization. 15

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year Special Backlog Examination, 2022

Course No: EEE-3125 Course Title: Electrical Installation in Buildings

Full Marks: 210

Time: 03 Hours

- N.B i) Answer any three questions from each section in separate script
ii) Figures in the right margin indicate full marks



Section-A

1. a) State & explain Ohm's law. Find the value of the current I in the circuit in fig 1(a). 10

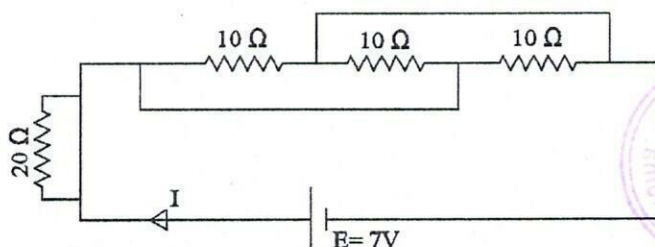


Figure 1(a)

- b) Explain KVL and KCL with required mathematics and figures. Determine the voltage V_a from the networks shown in fig 1(b)-I and 1(b)-II. 13

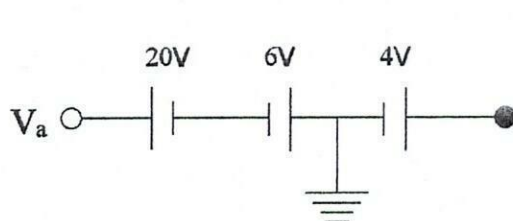


Figure 1(b)-I

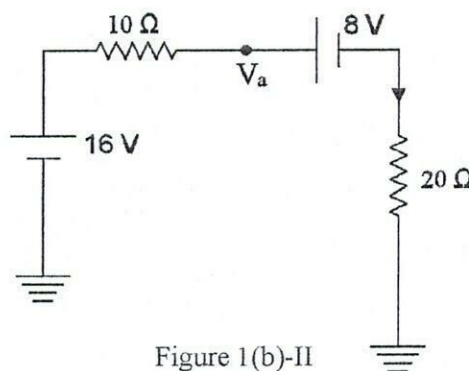


Figure 1(b)-II

- c) Three light bulbs are connected to a 9V battery as shown in fig 1(c). Calculate: 12
(i) Total current supplied by the battery.
(ii) Current through each bulb.
(iii) The resistance of each bulb.

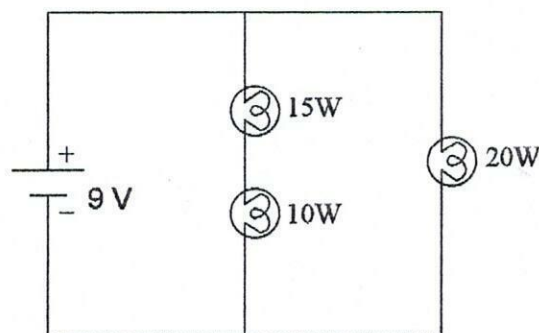


Figure 1(c)

2. a) Define node and branch of circuit. Obtain node voltages in circuit 2(a). 12

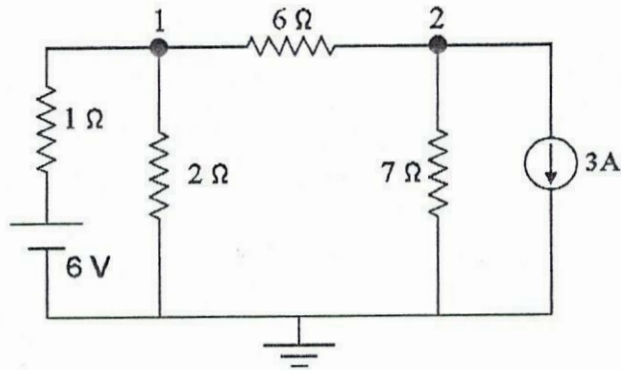


Figure 2(a)

- b) Explain source transformation method. Deduce equations for Delta (Δ) to Wye (Y) and Y to Δ conversion of a linear circuit. 13
- c) Using super position theorem, find V in the circuit in fig 2(c). 10

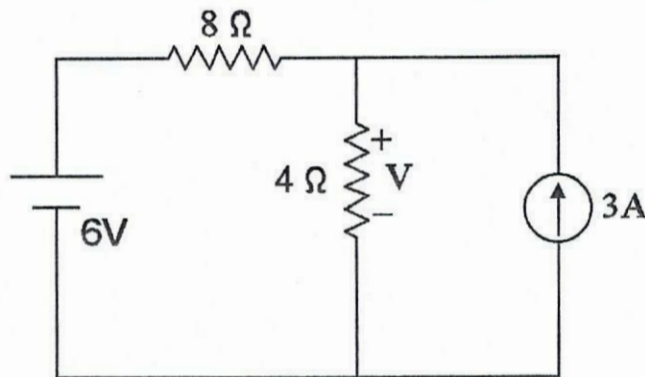


Figure 2(c)

3. a) Deduce the condition for maximum power transfer in a linear network. Also, derive the equation for maximum power. 11
- b) Explain Thevenin's theorem. Find the Thevenin equivalent circuit of the circuit shown in fig 3(b) to the left of the terminals a-b. 12

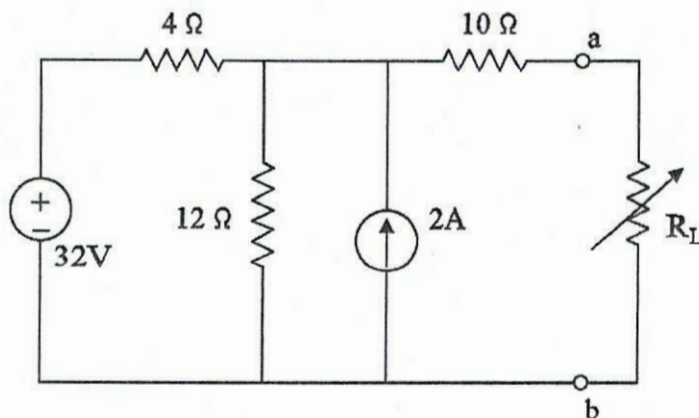


Figure 3(b)

- c) How wind power is generated from wind turbine system? Describe on-grid and off-grid solar PV system. 12
4. a) What is meant by alternating current and voltage? Draw the wave shape of a sinusoidal voltage whose maximum value is 10V and period is 5 sec. Also calculate its form factor. 10
- b) What are the different sources of renewable energy usable in house building? Discuss in the prospect of Bangladesh. 12
- c) Compare alternating current with direct current. What is the phase relationship between the sinusoidal wave forms of the following sets? 13
- Set-1: $v = 3 \sin(\omega t - 150)$
 $i = -2 \cos(\omega t - 60)$
- Set-2: $v = 10 \cos \omega t$
 $i = 5 \sin(\omega t + 45)$

Section-B

5. a) Briefly explain luminous flux, luminous intensity, illuminance and luminance with proper illustration. 13
- b) A workshop sized 40x60 ft. by 12 ft. height is to be illuminated to 45 lumens per sq.ft. on the working plane. If coefficient of utilization is 0.6 and the source gives out 15 lumens per watt, find the total wattage required and number of lamps assuming description factor as 0.8. Use 50 watt light bulbs. 10
- c) What is electrical earthing and neutral wire? Explain why grounding is required with proper illustrations and equations. 12
6. a) What do you mean by lighting scheme? What are the various lighting schemes? Graphically show them and classify them with regards to amount of light received. 12
- b) Briefly explain depreciation factor, utilization factor and space-height ratio. 11
- c) An illumination on the working plane of 3foot candle is required on a rom 270'x50'. The lamps are required to be hung 15ft. above the work benches. Assuming space-height ratio of 1.25, utilization factor of 0.5 and a candle power depreciation of 20%, estimate the number, rating and disposition of suitable lamps. Efficiency of a lamp may be taken as 0.5 watt per candle power. 12
7. a) What is electrical wiring? Why fuse is not used in the neutral? Mention the advantages and disadvantages of conduit wiring system. 14
- b) Briefly explain the essential factors to be considered while determining conductor size. 08
- c) For electrical wiring installation in a building, total load is 4.5KW and total length of cable from energy meter to sub circuit distribution board is 35 feet. Supply voltages are 220V and temperature is 40°C (104°F). Find the most suitable size of cable from energy meter to sub circuit if wiring is installed in conduits. 13
8. a) Draw the wiring symbols and briefly explain the following items: 10
- i) Distribution fuse board with switches, lighting
 - ii) Socket outlet, 2pin 5 amp
 - iii) Exhaust fan
 - iv) Fire alarm push
 - v) Two- way switch
- b) A building having specification in the table is to be designed: 25

SL NO.	Rooms	Illumination (ft. candles)	Dimensions sq. ft	Plug
01	Master bed (1)	10	16 x 12	02
02	Bedroom (2)	06	12 x 10	01
03	Drawing room (1)	08	11 x 10	01
04	Kitchen (1)	10	11 x 10	02
05	Bathroom (2)	8	8 x 5	-

- i) If utilization factor is 0.75 and depreciation factor is 0.80 and lumen per watt= 60 lumens, then calculate total lumens and number of lights required for this building.
- ii) Calculate total load of the building and determine conductor size. Consider plug load of 75W. Supply voltage is 220V.



Table for Q. 7(c) : Current rating of cables at 30° C

Current Rating in Amps	Number and diameter of wire in inch	Voltage drop/100 feet
11	1/0.044	9.8
13	1/0.029	9.1
16	1/0.036	7.7
21	1/0.029	6.4
28	1/0.036	5.3
34	7/0.044	4.1
43	7/0.052	4
56	7/0.064	3.5
66	19/0.044	3.2
77	19/0.052	2.7
105	19/0.064	2.5

Table for Q. 7(c) : Temperature factors

Temp Factor	1.02	1	0.97	0.94	0.91	0.88	0.77	0.63
Temp °C	25	30	35	40	45	50	55	60

Table for Q. 8(b) : Conductor Size Calculation

Size of conductor		2 cables dc or Single-phase ac	
Normal Area Sq. mm	Number and diameter of wire in mm	Current Rating in Amps	Approx. length of run for voltage drop in meters
1.5	1/1.40	10	2.9
2.5	1/1.80	15	3.6
4	1/2.24	20	3.9
6	1/2.80	27	4.3
10	1/3.55	34	5.4
16	7/1.70	43	7.0
25	7/2.24	59	8.5
35	7/2.50	69	9.3
50	7/3.0	91	10.1

