Khulna University of Engineering & Technology

Department of Architecture
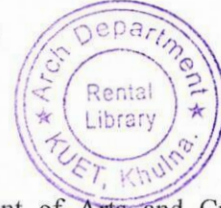
B. Arch. 3rd Year Backlog Examination, 2022

Course no: Arch 3131   Course title: Modern Architecture

Full Marks: 210   Time 3 hrs.

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)	Evaluate the underlying phenomenon behind the development of Arts and Craft Movement during industrial revolution.	15
	b)	Mention the emergence of modern architecture from the perspective of material, technology and changing cultural values.	20
2.	a)	How the design pattern of "Crystal Palace" made itself different from conventional architecture?	15
	b)	Demonstrate the influences behind the development of modern architecture in the late 18th century.	20
3.	a)	Elucidate the ideology of Architect Karl Friedman Schinkel under the concept "Building must contain elements of the poetic and the past, and have a discourse with them".	20
	b)	Demonstrate the mainstream of Romantic Movement, and the emergence of the Gothic Revival in the 19th century.	15
4.	a)	Evaluate the contribution of Walter Gropius in architecture practice to reform and redesign the performing art with a socio political meaning.	15
	b)	Write short note on:(any 04)	4x5=20

        i. Rococo
       ii. Chicago Fire
      iii. Art Nouveau
      iv. Form ever follows function
       v. Expressionism

Section B

5.	a)	What do you understand by modernity, modernism and modernization? Briefly explain the characteristics of modern movement in architecture.	10+10=20
	b)	Discuss the role of Bandaranaike Memorial International Conference Hall (BMICH) in Colombo for projecting Sri-Lanka's influence among third world nations.	15
6.	a)	Briefly explain the architectural style of 'Brutalism' with reference to Corbusier's work in India.	25
	b)	Briefly explain Kahn's differentiation between served and servant space. How did Achyut Kanvinde use this principle in his buildings?	5+5=10
7.	a)	How did the 'Tokyo Bay Plan' by Kenzo Tange inaugurate the Metabolist Movement? Explain.	15
	b)	Briefly discuss the project of New Gourna in Egypt with reference to Hassan Fathy's modernist style.	20
8.	a)	What were the philosophy of modern architects in India during 1950s? Explain with reference to the works of Joseph Allen Stein.	5+20=25
	b)	Briefly explain the structural innovation in State Trading Corporation, Delhi by Raj Rewal.	10

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year Backlog Examination, 2022

Course No: ME 3125   Course Title: Mechanical Equipment 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) What are some typical sources of fire hazards within architectural spaces, and   15
    how can architects integrate preventive measures into their design to mitigate these
    risks?

    b) What is a fire sprinkler system? How are they classified? List the advantages   12
    and disadvantages of fire sprinkler system.

    c) How can you relate fire extinguishing system with the type of fire generation?   08
    Discuss with proper justification.

2. a) Briefly explain the following terms: 12
       i.   Geometric stair
       ii.   Interval for lift
       iii. Lift performance
       iv.   Handling capacity

    b) Why do the number and size of lifts are a major concern in architectural layout? 08
    Briefly discuss.

    c) An office block with 20 storeys above ground floor having a group of four lifts   15
    with unified starting and stopping times is to have a floor area above the ground
    floor of 8000 m^2 and floor height of 3m. Each car of the lifts has a capacity of 20
    person and a speed of 2.5ms^{-1}. The clear door width is to be 1.1m and the doors are
    to open at a speed of 0.4ms^{-1}. Estimate the interval and quality of service that is to
    be provided.

3. a) Using a schematic diagram, identify and explain the main components of an   13
    escalator.

    b) List the differences between parallel escalator and crisscross escalator. Also,   10
    write the safety concerns while designing a escalator.

    c) A ramp is to be designed with a ramp rise of 500mm and the running distances   12
    will be 10m. Determine the gradient ratio and the slope percentage for that ramp.

4. a) What is meant by population mapping? How GIS is related to population   10
    mapping?

    b) What ethical considerations and privacy concerns should be taken into account   10
    when conducting population mapping studies?

    c) In environmental conservation efforts, how can population mapping guide   15
    decisions on wild life habitant preservation and sustainable land management.

Section-B

5. a) What is meant by HVAC system? Describe the various components of a HVAC   13
    system with neat sketch.

b) What does it mean by 'human comfort'? What are the factors that affect human comfort? Explain.   12

c) Describe the significance of air handling unit (AHU) in central air conditioning system.   10

6. a) How space heating and space cooling both can be attained using geothermal energy? Explain.   13

b) What are the differences between hydronic and radiant floor heating system?   10

c) Describe the working principle of a vertical boiler. How boiler can be used in building heating system? Explain.   12

7. a) Define ventilation. What are the purposes of ventilation?   08

b) Classify mechanical ventilation. Describe all of them with necessary diagrams.   12

c) An auditorium has a capacity of 1000 seats and a volume of 6000 m^3. The recommended minimum rate of fresh air supply is 2 air changes per hour. Calculate the minimum required ventilation rate in m^3/sec and compare this rate with the specification that the fresh air supply rate should be at least 4-5 times higher than the actual rate of inhalation (Assume, an inhalation rate of air is $2m^3$/hr per person).   15

8. a) Describe the mechanism of vapour absorption refrigeration system with the help of a schematic diagram.   13

b) Briefly explain the differences between refrigerator and heat pump.   13

c) Write short note on –   09
   i.   Dehumidifier
   ii. Filter
   iii. Damper

Khulna University of Engineering & Technology

Department of Architecture

B. Arch. 3rd Year 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
       ii) Figures in the right margin indicate full marks

Section-A

1. a) What is meant by under reinforced, over reinforced and balanced design? What type   10
        of design is preferable and why?

    b) A cantilever rectangular beam with a span of 10 ft, having a width of 12 in. and   25
        thickness 20 in. The beam is reinforced with five #6 bars at the top. What is the
        maximum uniformly distributed load that can be resisted? Assume, f'_c=3000 psi and
        f_y = 60,000 psi. [See fig. 1(b)]
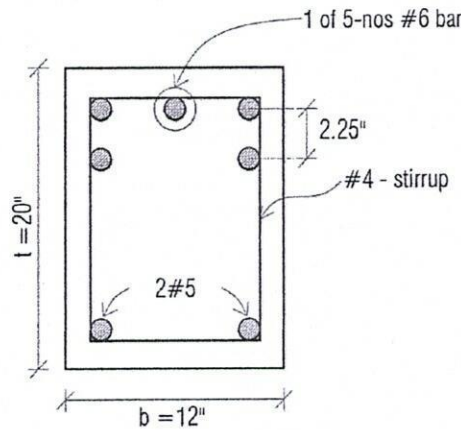
Figure. 1(b)

2. a) Explain the necessity of clear cover. Why is the clear cover for foundation larger than   08
        beam?

    b) A simply supported rectangular beam with span of 20ft supports a dead load of   27
        500lb/ft, live load of 800lb/ft and a concentrated load of 1200lb at the middle of the
        span. Design the beam by strength design method. Use f'_c = 4000 psi and f_y = 60,000
        psi.

3. a) Derive the expression for calculating nominal moment at which the beam will fail.   10

    b) A rectangular beam is to be designed to carry a service load of 2.47 k/ft and a dead   25
        load of 1.05 k/ft on an 18 ft simple span is limited in cross-section for architectural
        reasons to 10 in. width and 20 in. total depth. What steel area must be provided? Use
        f'_c = 4 ksi, f_y = 60 ksi. Follow WSD method.

4. a) When a beam is considered as a T – beam? How can you calculate the effective flange   08
        width of a T – beam?

    b) An isolated T – beam is composed of a flange 28 in. wide and 6 in. deep casted   27
        monolithically with a web of 10 in. width that extends 24 in. below the bottom surface
        of the flange to produce a beam of 30 in. total depth. Tensile reinforcement consists
        of six #10 bars placed in two rows at 1 in. vertical spacing. The centroid of the bar
        group is 26 in. from the top of the beam. If f'_c = 3000 psi and f_y = 60,000 psi, what
        is the design moment capacity of the beam?

Section-B

5. a) What do you mean by diagonal tension? Describe diagonal tension cracking in beams with appropriate sketch.   10

   b) A rectangular slab down in figure carries a live load of 80 psf and its self-weight. The beam and column position is also known below. $f'_c = 3500$ psi and $f_y = 60$ ksi. Design the slab by strength design method. [See fig. 5(b)]   25
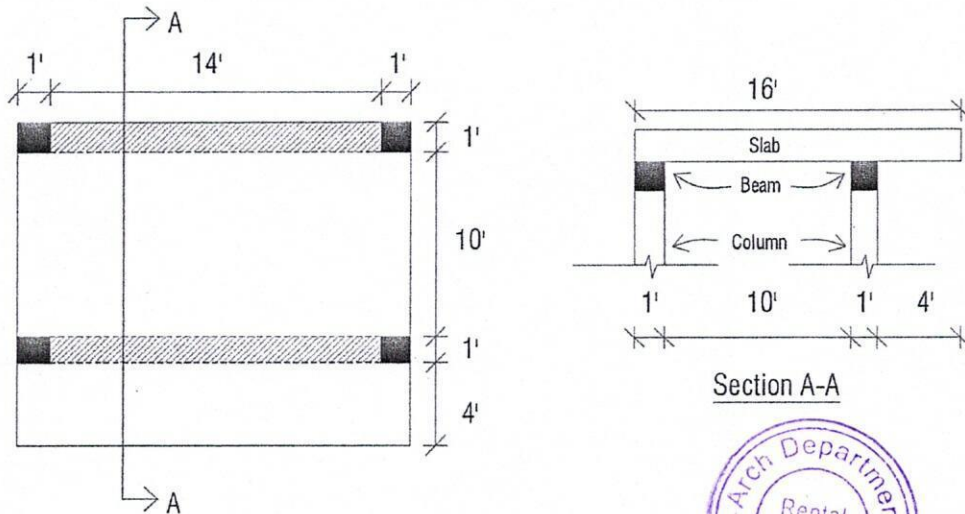

Figure. 5(b)

Section A-A

6. a) "A rectangular edge-supported slab, which is supported on all four sides by integral beams may act as a one-way slab" – Explain the statement mathematically with appropriate illustration.   10

   b) Why is temperature and shrinkage reinforcement provided in slab?   05

   c) A 15'X15' slab has a thickness of 6" and carrying a live load of 100 psf, as shown in figure below. Determine the factored design load in each beam. [Note: Consider self-weight of all structural member] [See fig. 6(c)]   20

Dimension:
C1: 12" X12"
B-1: 12" X 20"
B-2: 12" X 18"
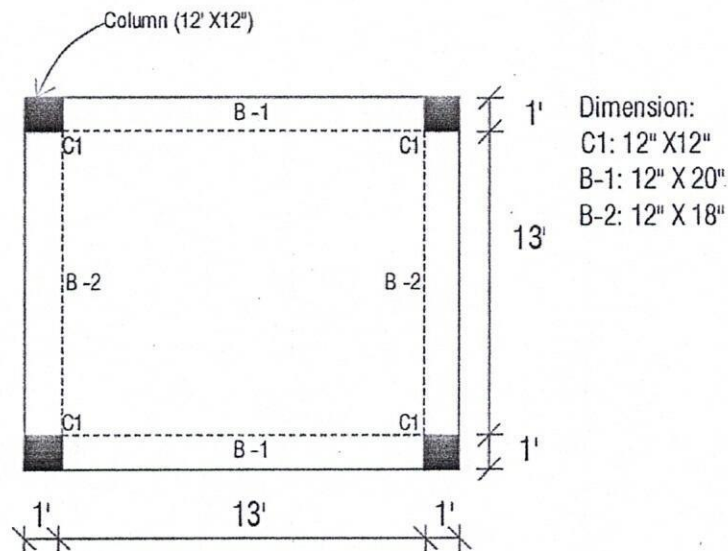
Figure. 6(c)

7. a) Why shear failure is more devastating compared to the flexural failure?   10

   b) A rectangular beam (14"X20") carries a total working load of 6.5 k/ft on an overhanging beam as shown in figure below. $f'_c = 3000$ psi and $f_v = 18,000$ psi.   25

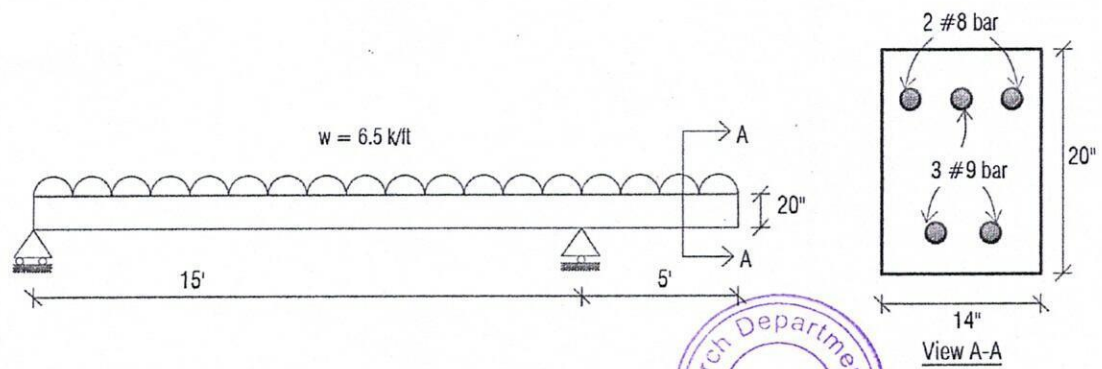Design the web reinforcement and also show the reinforcement detailing. [See fig. 7(b)]

Figure. 7(b)

8. a) What is corner reinforcement? Why and where is it needed? How is it placed and in what amount? **10**

    b) A reinforced concrete two-way slab panel consists of square bays measuring 25ft X 25ft between the supporting beams. It is continuous on three sides and discontinuous in one side. The floor has to carry a live load of 80 psf, a floor finish of 20 psf and its own weight. Use $f'_c = 4000$ psi and $f_y = 60,000$ psi. ACI moment coefficients are as follows – **25**

$$C_{a.neg} = 0.061, C_{a.dl} = 0.023, C_{a.ll} = 0.030$$
$$C_{b.neg} = 0.033, C_{b.dl} = 0.020, C_{b.ll} = 0.028$$

Design the slab panel and show reinforcement detailing.
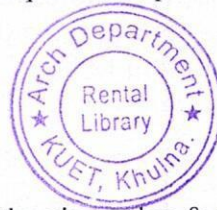
Full Marks: 210   Time: 03 Hours
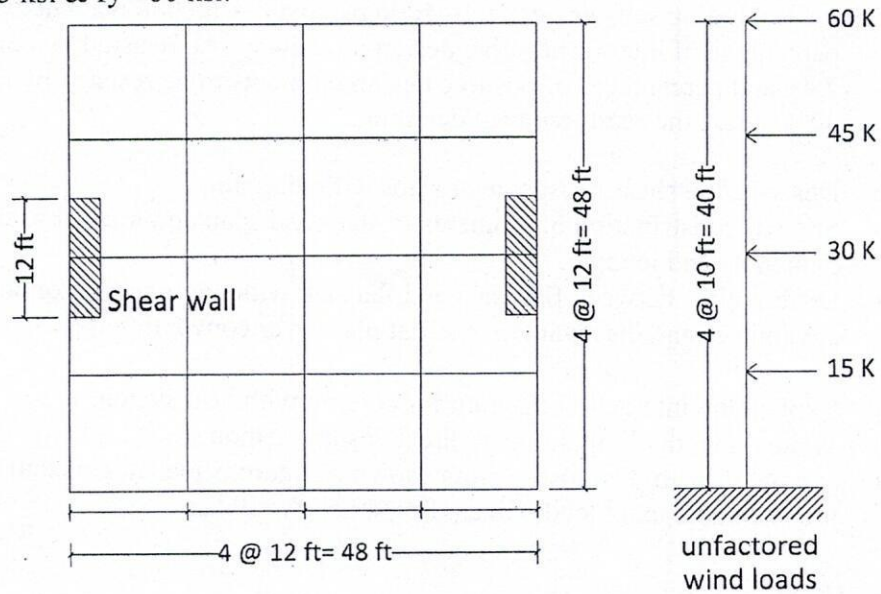
N.B   i) Answer any three questions from each section in separate script
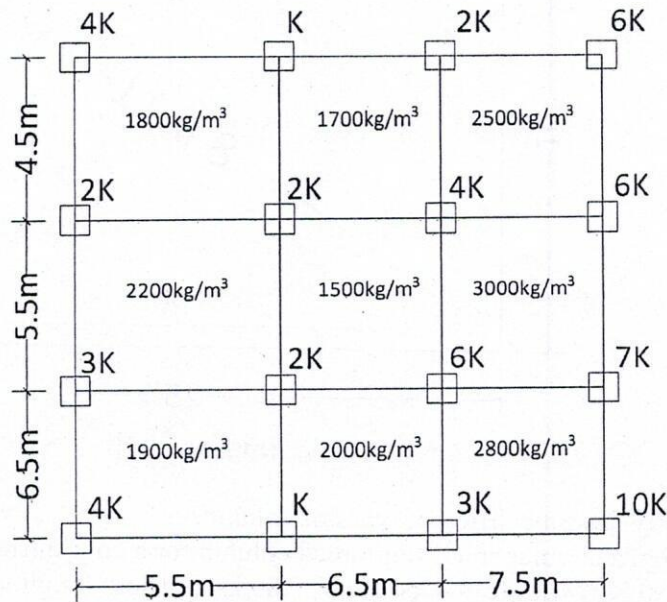   ii) Figures in the right margin indicate full marks

Section-A

1.   Design the shear wall for shear and moment for the given plan & elevation shown in   35
      the Figure. The structure is subjected to unfactored wind load. Material property
      $f'c = 3.5$ ksi & $fy = 60$ ksi.

[Figure 1]

2.   a)   Determine the center of mass & center of stiffness of the floor from the given plan.   20

K= Stiffness

[Figure 2(a)]

      b)   Draw a neat sketch of seismic zones of Bangladesh with location & zone factors.   10
   c)   What are the primary causes of earthquake?   05

3. a) What is diagrid structural pattern & what type of benefit you will get by using a diagrid system over frame structural system? 10

b) Write down the effects of earthquake & how can a structure be safe from earthquake? 15

c) What are the general design philosophy of earthquake design? 10

4. a) Write down the advantages of shear wall. 10

b) Why is it necessary to reduce the distance between center of mass & center of rigidity? 10

c) Determine the reinforcement needed for the shear resisting wall of 8 inch thickness & 12 ft height where the shear force is 300K. The length of the shear wall should be between 10 ft to 12 ft. 15

Section-B

5. Design an interior flat plate having center-to-center span length of 16 ft in both directions. The plate is supported on square columns of dimension 12 in X 12 in and height of 10 ft. Assume a service live load of 82 psf and a service dead load of 122 psf (including self-weight), $fc' = 4000$ psi and $fy = 60,000$ psi. Given that the percentage of interior negative design moments to be resisted by column strip is 75% and percentages of positive design moments to be resisted by middle strip is 40%. Draw the reinforcement detailing. 35

6. a) Describe the shear resistance of slabs with diagram. 10

b) Show the distribution of moments in slab (end span and interior span) with their plan view and loading. 10

c) Differentiate between flat plate and flat slab with appropriate sketch. Write down the advantages and disadvantages of flat plate over conventional RCC slab. 15

7. a) Explain the interaction diagram for column with neat sketch. 10

b) Write down the limitations of direct design method. 10

c) A column with the cross-section shown in figure is loaded concentrically. Calculate the allowable axial load. Given. $fc' = 4$ ksi, $fy = 50$ ksi. 15
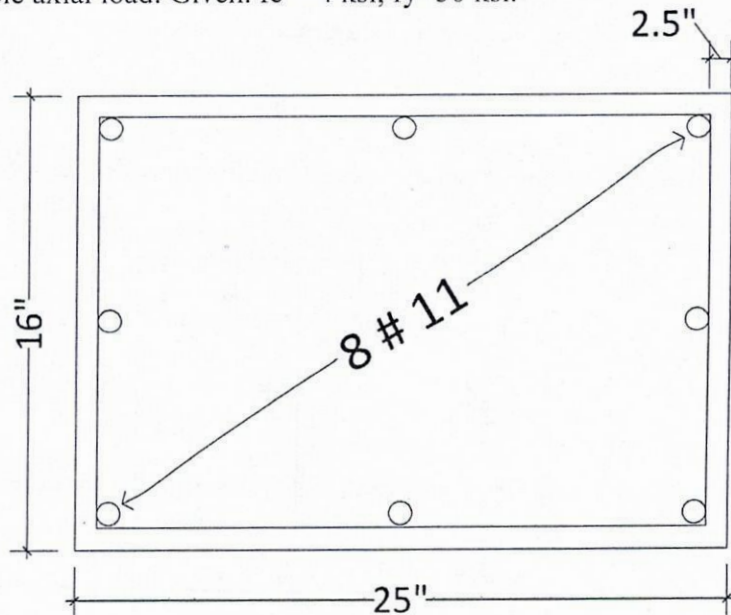
[Figure 7(c)]

8. a) Briefly describe different types of column. 10

b) Design a circular spiral reinforced column for a concentric allowable working load of 480 kips with $fc' = 4$ ksi and $fy = 60$ ksi for both longitudinal steel and spiral. Show reinforcement detailing. Assume steel ratio is 2%. 25

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year 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 a separate script
        ii) Figures in the right margin indicate full marks

Section-A

1. a) Write short notes on:
        i.   Ohm's Law
        ii.   Kirchhoff's voltage & current law
        iii.   Independent and dependent source   12

   b) Three light bulbs are connected in series to a **100V** battery, as shown in
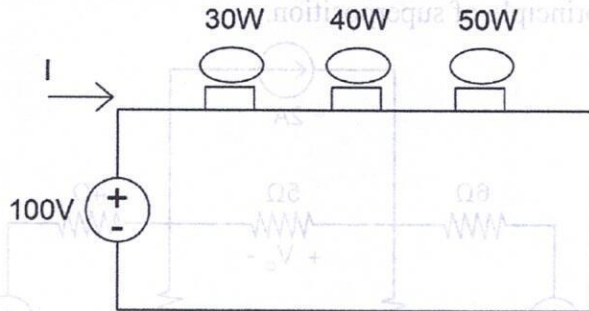   **Figure 1(b)**. Find the current **I** through the bulbs.   10

Figure 1(b)

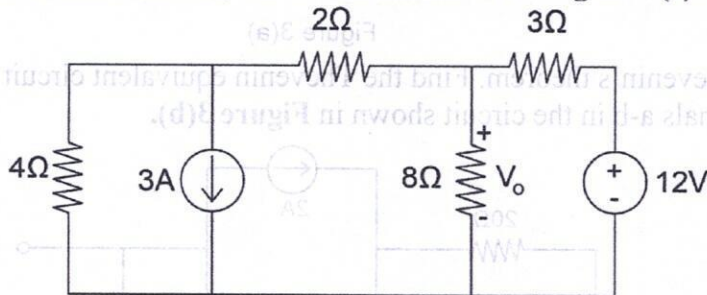   c) Using source transformation, find V_o in the circuit in **Figure 1(c)**.   13

Figure 1(c)

2. a) Find the value of **I** in the circuit of **Figure 2(a)**.   11

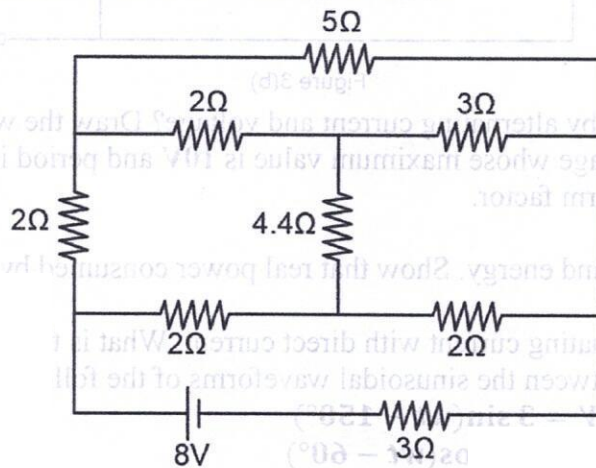
Figure 2(a)

b) Using mesh analysis, obtain i_a, i_b, i_c in the circuit of **Figure 2(b)**. 12
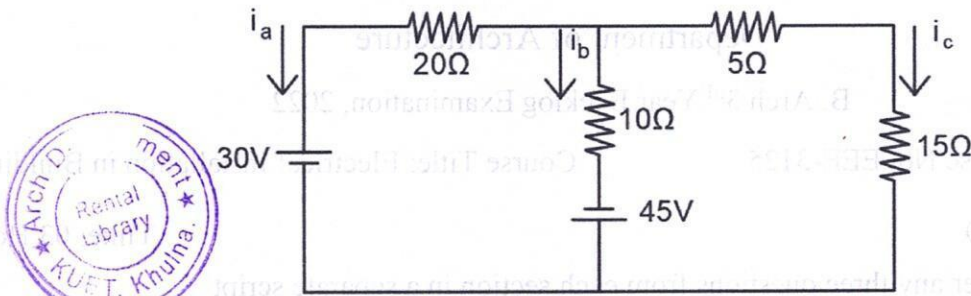

Figure 2(b)

c) Find i_o using nodal analysis. **Figure 2(c)**. 12
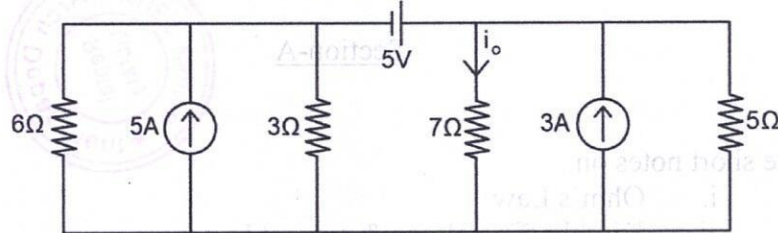

Figure 2(c)

3. a) State the principle of superposition. Determine V_o in the circuit of **Figure 3(a)** using the principle of superposition. 13
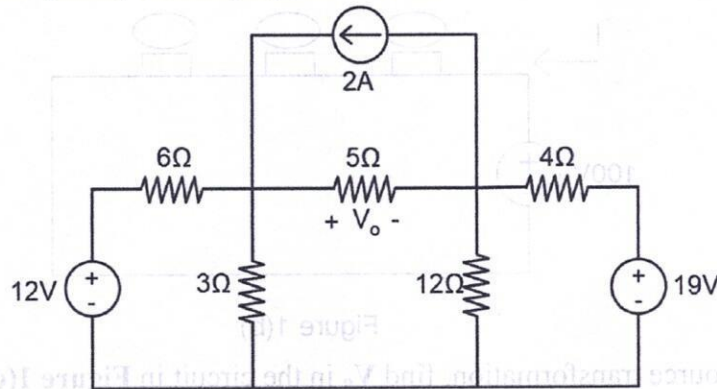

Figure 3(a)

b) State Thevenin's theorem. Find the Thevenin equivalent circuit with respect to terminals a-b in the circuit shown in **Figure 3(b)**. 12
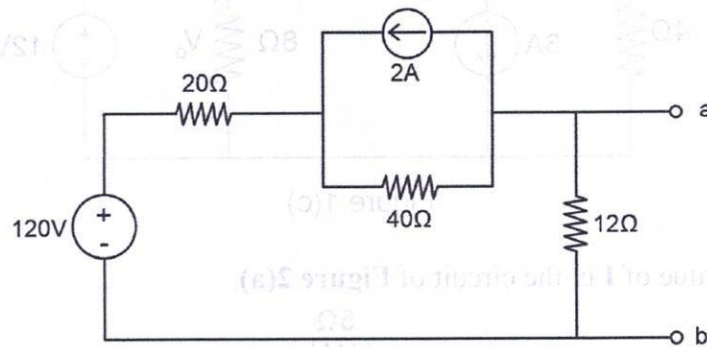

Figure 3(b)

c) What is meant by alternating current and voltage? Draw the wave shape of a sinusoidal voltage whose maximum value is **10V** and period is **5sec**. Also Calculate its form factor. 10

4. a) Define power and energy. Show that real power consumed by a capacitor is zero. 08

b) Compare alternating current with direct current. What is the phase relationship between the sinusoidal waveforms of the following sets? 12

Set-1: $V = 3\sin(wt - 150°)$
$i = -2\cos(wt - 60°)$

Set-2: $V = 10\cos wt$
$i = 5\sin(wt + 45°)$

c)   What are the different sources of renewable energy usable in house-building? Show the layout of a solar PV system.   09

d)   Write short notes on power factor and power triangle.   06

Section-B

5.   a)   What do you mean by illumination? Briefly explain the laws of illumination.   15

     b)   Define and explain light, solid angle, lux, lumen & steradian.   10

     c)   A workshop measures **20x40ft**. and is lighted by 10 lamps which are each rated at **200 watts** and have an efficiency of **15 lumen/watts**. Assuming a depreciation factor of **1.5** and a coefficient of utilization of **0.5** find the illumination at workshop plane.   10

6.   a)   Briefly explain the factors that are needed to be considered when designing a lighting scheme.   13

     b)   A room **50ftx20ft** is illuminated by twenty **200 watt** lamps. The M.S.C.P of each lamp is **250**. Assuming a depreciation factor of **0.8** and utilization factor **0.6**, find the average illumination produced on the floor.   12

     c)   What is electric earthing? Explain why grounding is required with necessary illustrations and equations.   10

7.   a)   What is electrical wiring? Explain tree, looping-in and ring wiring systems.   12

     b)   Explain the factors that affect the conductor size estimation.   10

     c)   Mention the advantages and disadvantages of conduit wiring system.   08

     d)   Why is the fuse not used in the neutral?   05

8.   Draw the floor plan of a primary school consist of two classrooms, one teacher's room, one veranda and two toilets.   35
          i)   Calculate the illumination of the floor plan
          ii) Draw the electrical installation of this floor plan building according to calculated illumination.
          iii) Draw the conduit run and electrical wiring diagrams for both light and power circuits according to the installation plan.
          iv) Calculate the load and determine the conductor size.
          v)   Finally estimate the quantity of conduit and wire of different sizes required for complete curing of this building.