Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year 1st Term Regular Examination, 2023

Course No: EEE 3125   Course Title: Electrical Installation in Building

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 and explain KVL, KCL and Ohm's law using proper ckt diagram.   10
    b) Calculate the value of I and power supplied by the voltage source in the circuit   12
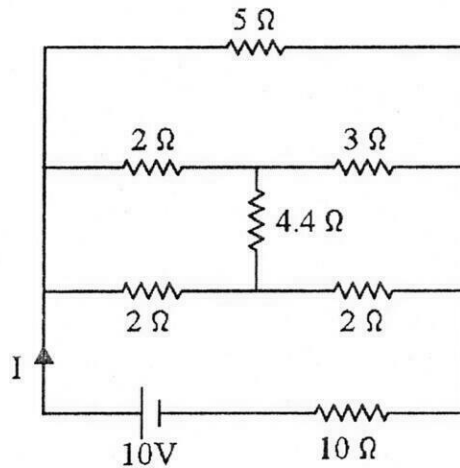   given in fig 1(b).

Fig. 1(b)

    c) Explain the effect of temperature on resistance. Find V_0 for the circuit given in   13
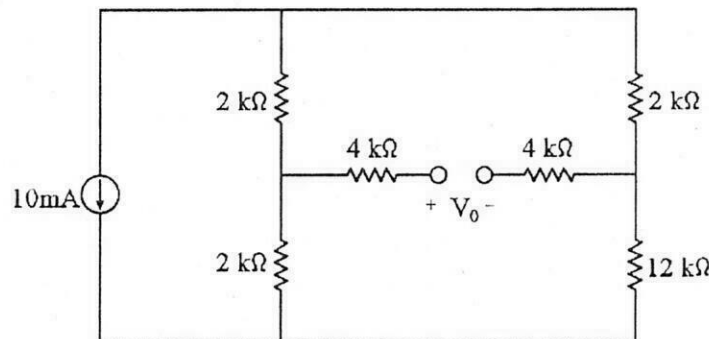   Fig 1(c).

Fig. 1(c)

2. a) Obtain the equivalent resistance at the terminals, a-b for the circuit in Fig. 2(a).   10
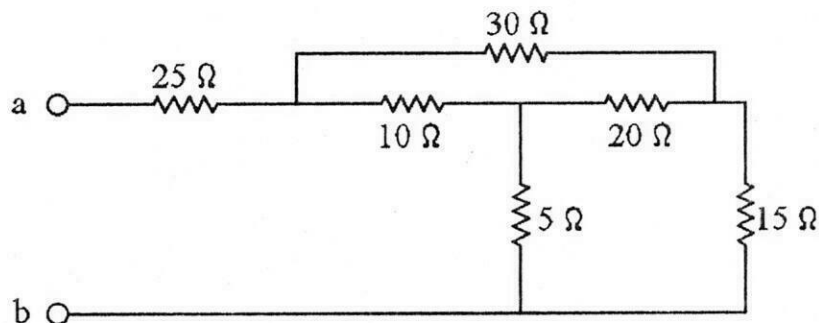

Fig. 2(a)

b) Define super mesh. Calculate the mesh currents i_1 and i_2 of the circuit in Fig. 2(b).   12
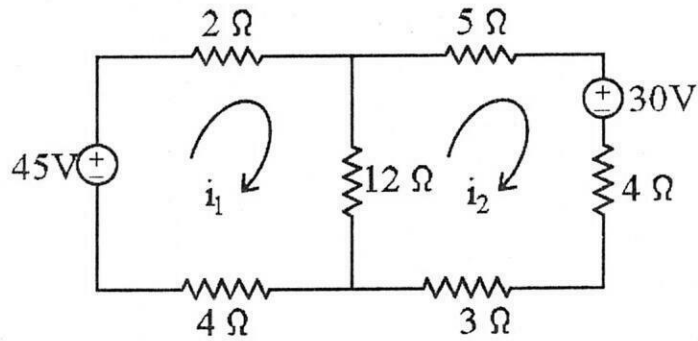

Fig. 2(b)

c) Explain effect of temperature on resistance. For the circuit in Fig. 2(c), obtain V_1 and V_2 using nodal analysis.   13
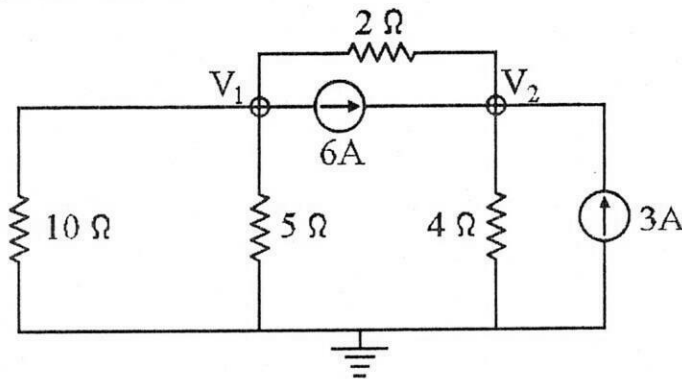
Fig. 2(c)

3. a) Explain linear property of circuit element. Find I in the circuit of Fig. 3(a) using superposition principle.   14
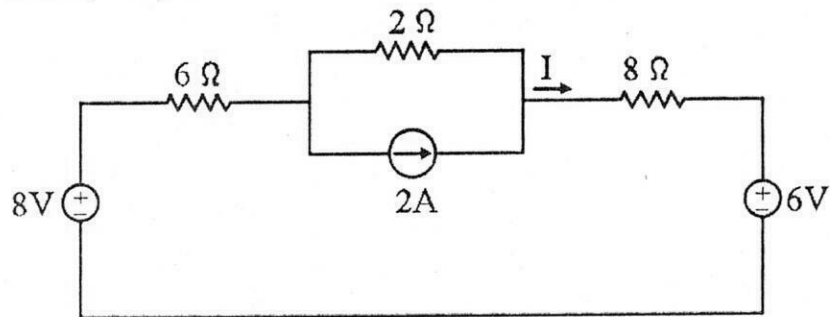

Fig. 3(a)

b) State maximum power transfer theorem. Find the value of R_L for maximum power transfer in circuit of Fig. 3(b). Also, find maximum power.   12
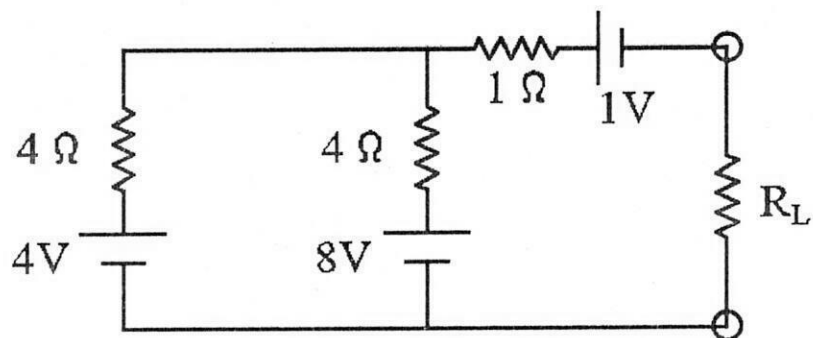

Fig. 3(b)

c) What are the sources of renewable energy for house-building? Explain the construction and working principle of fuel cell.   09

4. a) Write short notes on: 12
       i. Impedance
       ii. Power triangle
       iii. Power factor
       iv. Reactive Power

   b) Through vector diagram, show that capacitor consumes zero real power.   06

   c) For the network shown in Fig. 4(c), calculate   08
       i. Average power
       ii. Apparent power
       iii. Impedance
       iv. Power factor
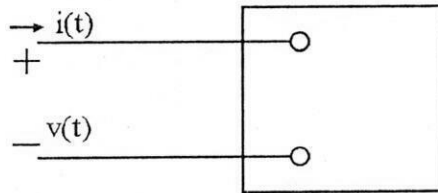
$$v(t) = 100 \cos(\omega t + 15°)$$
$$i(t) = 4 \sin(\omega t - 15°)$$

Fig. 4(c)

   d) What is form factor? Compare alternating current with direct current.   09

Section-B

5. a) Briefly explain Solid angle, Luminous flux, Luminous intensity and illumination with proper illustration. Find the total flux emitted by a source of one candle power.   13

   b) Define space-height ratio, Depreciation factor and Utilization factor. Write short notes on different types of lighting schemes.   12

   c) A workshop size 40cm×60cm by 12 ft height is to be illuminated to 45 lumens/m² on the working plane. If the coefficient of utilization is 0.8 and the source gives out 10 lumens per watt, find the total wattage required and number of lamps assuming depreciation factor as 0.8.   10

6. a) State lamberts cosine law and prove that illumination is proportional to the cosine of angle of incidence of luminous flux.   10

   b) Mention some limitations of Laws of illumination   05

   c) What are the factors on which the earth's resistance depended?   05

   d) A reading room 50m×20m×6m, requires an illumination of 40 meter-candle on the reading table. Assume utilization factor as 0.4, depreciation factor as 0.75, efficiency of each lamp as 0.75 watts/c.p. and the height of lamps above the reading table as 4m. The space-height ratio should be in between 1-1.3. Calculate (i) The no. of lamps required, (ii) C.P. of each lamp. Draw a sketch of arrangement of lamps.   15

7. a) What are the conventional system of wiring? What are the factors to be considered to select appropriate wiring system?   11

   b) Classify conduit wiring system. Mention advantages and disadvantages of conduit wiring system.   12

   c) Why is the fuse not used in the neutral? Explain tree, looping-in and ring wiring system.   12

8. a) Draw the wiring symbols and briefly explain the following items: 10
       i. Distribution fuse board with switches, lighting
       ii. Socket outlet, 2 pin 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
   i. If utilization factor is 0.75 and depreciation factor is 0.8 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 Qs. 8(b)

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

Table for Qs. 8(b): Conductor size calculation

Size of conductor		2 cables dc or single phase ac	
Normal area (sq. mm)	Number and diameter of wire (mm)	Current rating (Amps)	Approx. length of run for voltage drops (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	1/2.8	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	7/2.5	69	9.3
50	7/3.0	91	10.1

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year 1st Term Regular Examination, 2023

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) Why is WSD method still used in Bangladesh?   08

    b) Why is critical shear considered at a distance of 'd' from the face of the   07
        support?

    c) A slab shown in following figure carries a live load of 100psf and its self- 20
        weight. The beam position is also shown. Use $f'c = 2,500\,psi$, $fy = 60,000\,psi$. Design the slab and show the reinforcement detailing as well.

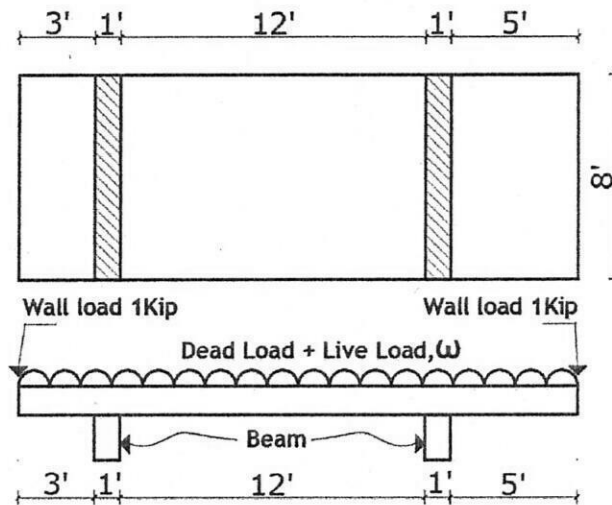
Figure 1(c)

2. a) Why is temperature and shrinkage reinforcement provided?   06

    b) A cantilever beam has a dimension of 18in (width) x 22in (effective depth).   29
        It carries a total working load of 5.0K/ft on a cantilever length of 9ft. Design
        the web reinforcement and show the reinforcement detailing. Use $f'c = 2,500\,psi$ and $fv = 20,000\,psi$.
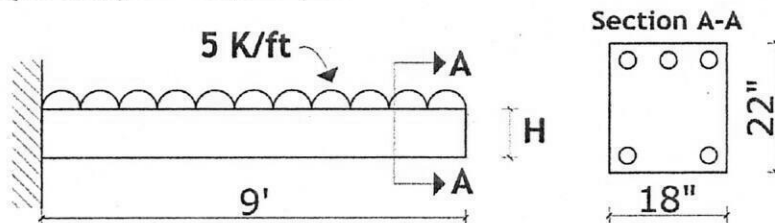
Figure 2(b)

3. a) What is corner reinforcement? Why is it provided?   06

    b) Why is strength reduction factor of 0.75 used for shear design, while a   10
        reduction factor of 0.9 used for flexural design?

    c) A 20'x16' slab has a thickness of 5.5" and carrying a live load of 80psf and 19
        its self-weight as shown in figure below. Determine the factored load utilized
        for the design of beam and supporting column.

Figure 3(c)

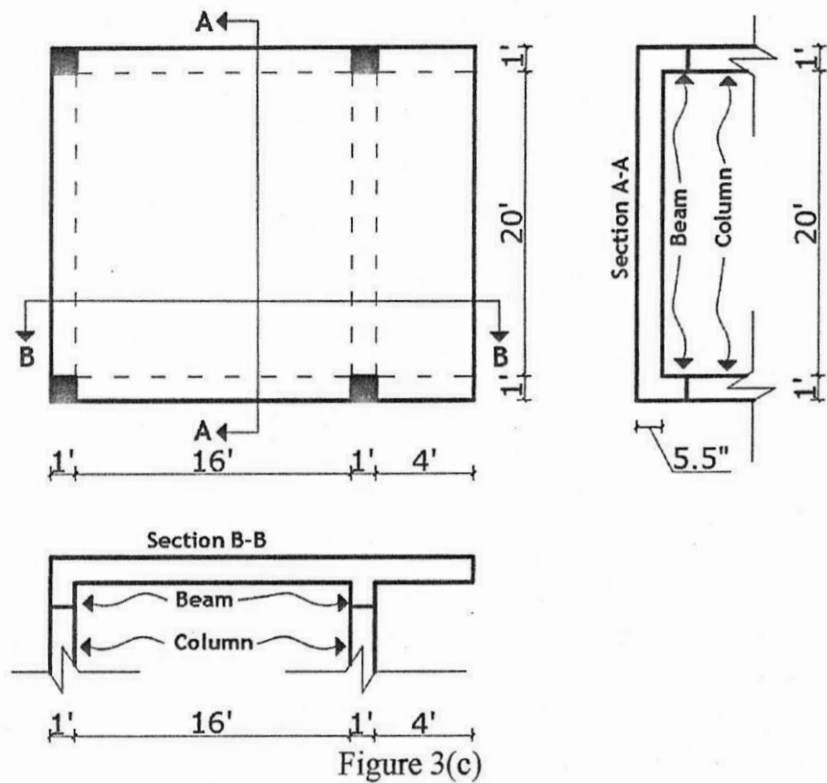4. Design an interior panel of a two-way slab floor system with four ends continuous having panel of 19ft x 25ft, supported on beams having width of 16in. The service live load is to be taken based on the function of the building; a service dead load consists of 30psf of floor finish in addition to its self-weight.   35

Function: Institutional Purpose   Use, $f'c = 3,000 \, psi, fy = 72.5Ksi.$
$Ca \, neg = 0.069$ $Ca_{DL} = 0.028$ $Ca_{LL} = 0.045$
$Cb \, neg = 0.022$ $Cb_{DL} = 0.009$ $Cb_{LL} = 0.014$

Section-B

5. a) Differentiate between analysis and design.   05

    b) Derive the expression for calculating nominal moment at which the beam will fail.   15

    c) A rectangular beam has the dimensions as shown in figure below is reinforced with three no. 8 bars. The concrete cylinder strength $(f'c)$ is 3,000 psi and the tensile strength in bending (modulus of rapture) is 450 psi. The yield point of the steel (fy) is 60,000 psi.   15
    Determine the stresses caused by a bending moment 40 K-ft.
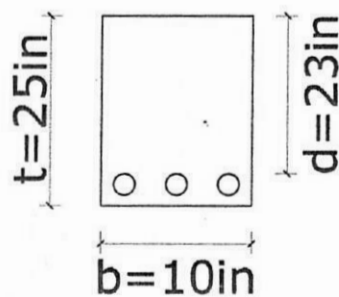

Figure 5(c)

6. a) Write down the advantages of reinforced concrete as a structural material.   08

    b) Design the overhanging rectangular beam as shown in figure supports a uniform live load of 1K/ft and dead load of 0.5K/ft. Design the beam by WSD method, and show reinforcement detailing (long section and cross section). Use $f'c = 3,000 \, psi$ and $fy = 60,000 \, psi.$ 27
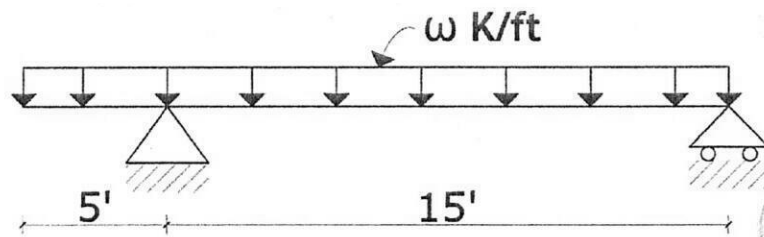
ω K/ft

5'   15'

Figure 6(b)

7. a) Distinguish between singly and doubly reinforcement beam. 05

    b) A rectangular concrete beam of width $b = 10''$ is limited by architectural   30
        considerations to a maximum total depth $h = 20''$. It must carry a factored
        moment 210 K-ft. Design the flexural reinforcement for this member.
        Assume, $f'c = 4Ksi$ and $fy = 60Ksi$. Draw a sketch of the final design.

8. a) Draw strain and stress distribution for T-beams with possible positions of   15
        neutral axis. Derive the expression of nominal moment capacity of T-beams
        having neutral axis in web.

    b) Determine the design strength of the T-beam shown in figure below with   20
        $f'c = 4Ksi$ and $fy = 60Ksi$. The beam has a 30ft span and is cast
        monolithically with a floor slab that is 4in thick. The clear distance between
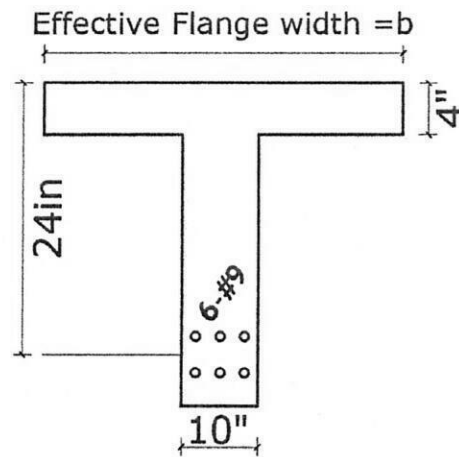   web is 50in.

Effective Flange width =b

24in

4"

6-#9

10"

Figure 8(b)

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year 1st Term Regular Examination, 2023

Course No: Arch-3131   Course Title: Modern 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) Define and exemplify "modernism" as a movement.   05

    b) Which tools of modernism do you think are responsible for hindering the   30
       moral progress of our generation?

2. a) How does the ideology of Beaux Arts differ from that of a modernist one?   05

    b) Do you think Corbusier's Notre-Dame du Haut is the trust embodiment of   30
       architecture's third conception? Elucidate in favour of your answer.

3. a) How does James Bogardus transform the aesthetic and constructional   05
       outlook of skyscrapers?

    b) Referring to mobile homes, critically evaluate the postulation that Hannes   30
       Meyer's functional standardization of architecture has deprived people of
       the ability to appropriate their spaces.

4. a) Briefly mention why feeling of the irrational is necessary in architecture.   05

    b) How do the Bauhaus Buildings at Dessau initiate a different feeling for   30
       space? Refer to a few modern traits of architecture to justify your answer.

Section-B

5. a) Explain the synthesis of two stylistic trends in Hiroshima Peace Memorial   10+5
       Museum (1955) by Kenzo Tange. What were the Japanese elements in   =15
       this project?

    b) How did Israel and China exercise globalism through modernist design in   20
       the third world countries during the post war area? Explain.

6. a) Briefly discuss the abstract Neo- Kahnian typologies developed by   15
       Muzharul Islam and Stanley Tigerman for monolithic brick construction in
       Bangladesh.

    b) Briefly discuss Kahn's differentiation between served and servant space.   5+15
       How did the Centre for Environmental Planning and Technology (CEPT)   =20
       building by B.V. Doshi incorporate the principles and elements of
       Le Corbusier and Lois I. Kahn? Explain.

7. a) Briefly discuss Fathy's modernist style with reference to the New Gourna   25
       Village in Egypt.

    b) How did Youogi Olympic Stadium in Tokyo combine traditional Japanese   10
       architecture with Western modernist aesthetics? Explain.

8. a) Outline various architectural elements formulated by Charles Correa   5+10
        considering Indian cultural and climatic contexts. Discuss their   =15
        incorporation in anyone of his project.

    b) Write short notes on: 10+10
        i.   Staff housing at French Embassy in Delhi   =20
        ii.   Asian Games Village

Khulna University of Engineering & Technology

Department of Architecture

B. Arch 3rd Year 1st Term Regular Examination, 2023

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) Describe the main firefighting methods and techniques used to control and extinguish fire and how they target the essential elements of combustion.   08

    b) What are the critical components and advantages of a fire sprinkler system and in what environment might these system be less effective? Explain.   08

    c) Discuss the fire triangle and classify different types of fires. Identify the appropriate fire extinguisher for each class.   10

    d) Explain the role and function of-   09
       I.   Fire blanket
       II. Fire hydrant system
       III. Smoke detector

2. a) How do different types of stairs and their components contribute to the overall design and functionality of a building?   10

    b) Explain the criteria for the location and placement of elevators. Outline the key aspects of elevator maintenance.   10

    c) An office block with 30 storeys above ground floor having a group of 6 lifts with unified starting and stopping times is to have a floor area above the ground floor of 12000 m² and floor height of 3m. Each car of the lifts has a capacity of 20 persons and a speed of 2.5 M/s. The clear door width is to be 1.1 m and the doors are to open at a speed of 0.4m/s. Estimate the peak demand, interval and quality of service that is to be provided.   15

3. a) Describe the main components of an escalator and explain the function of each component in ensuring the safe and efficient operation of the system.   10

    b) Illustrate the advantages and disadvantages of using escalations in buildings and discuss the common safety issues associated with escalation.   10

    c) What are the requirements for the ideal performance of passenger elevators?   10

    d) What are the key differences between elevators and escalators?   05

4. a) With the schematic diagram, show the standard dimensions of escalator.   08

    b) Discuss the benefits and challenges GIS for population mapping in rural vs urban areas. Provide examples to support your answer.   12

    c) Outline the steps you would take for a GIS project addressing a specific urban issue in your city.   15

Section-B

5. a) What are the primary components of an HVAC system and how does each component contribute to the overall efficiency of HVAC? 10

    b) Explain the modes of heat transfer. How are they utilized in the design and operation of HVAC system? 10

    c) Define thermal comfort. Discuss the factors affecting comfort air conditioning. 10

    d) How is thermal energy quantified in HVAC system? Explain. 05

6. a) Explain the working principle of boiler. Compare and contrast water tube boiler and fire tube boiler. 12

    b) With a schematic diagram explain the working principle of VAR system. In which situation, VAR system is more preferred than VCR system. 13

    c) How does central heating system work? Briefly discuss the considerable issues in central heating system. 10

7. a) How do mechanical ventilation system operate and what are the different types of mechanical ventilation systems available. 10

    b) What are the primary purposes of ventilation in a building? How do different factors influence the design and selection of a ventilation system? 15

    c) What are the benefits and limitations of natural ventilation compared to mechanical ventilation system? 10

8. a) Draw a schematic diagram of summer air conditioning system. Why heating coil is used in summer air conditioning system? 12

    b) Briefly describe the components of a central air conditioning system. Why cooing tower is necessary in this system? 15

    c) How is relative humidity maintained in a unitary air conditioning system? 08