RAILWAY AND BRIDGE ENGINEERING

(Code : CET-603)

Full Marks : 70 *Time* : 3 hours

Answer any five questions

Figures in the right-hand margin indicate marks

1. (*a*) Define cart. 2
   (*b*) Write the advantages of railway. 5
   (*c*) Describe briefly about the selection of gauge. 7

2. (*a*) What is the maximum value of super elevation provided in a track as per railway board ? 2
   (*b*) What are the different types of rails ? Write the functions of rail. 5
   (*c*) Prepare a neat sketch of a typical cross-section of an embankment with the ballast section for a single-line or double-line broad gauge. 7

3. (*a*) What do you mean by gradient ? 2
   (*b*) Explain the functions and requirements of sleepers. 5
   (*c*) Explain various types of crossing in use on Indian Railways. 7

4. (*a*) What do you mean by crossing ? 2
   (*b*) List the requirements of an ideal rail joint. 5
   (*c*) Write the necessity of maintenance and advantages of maintenance. 7

5. (*a*) Define cross drainage. 2
   (*b*) Write the requirement of an ideal bridge. 5
   (*c*) List out various design data to be collected and the purpose of surface investigation for construction of bridge. 7

6. (*a*) What is a culvert ? 2
   (*b*) Give brief description of various types of causeway in use. 5
   (*c*) Mention and explain the general principles of the design of bridge foundations. 7

7. (*a*) What do you mean by coffer dam ? 2
   (*b*) Classify and describe briefly each classification of steel and concrete bridge. 5
   (*c*) Write down the functions and explanatory notes for the types of piers. 7

ADVANCED CONSTRUCTION TECHNIQUES AND EQUIPMENTS

(Code : CET-605(E-iii))

Full Marks : 70 *Time* : 3 hours

Answer any **five** questions

Figures in the right-hand margin indicate marks

1. (*a*) What do you mean by workability of concrete . 2

(*b*) What are the durability requirement of concrete as per IS 456 ? 5

(*c*) What are different methods for measuring workability and explain any one method ? 7

2. (*a*) Define light intensity ? 2

(*b*) Describe the types of wiring ? 5

(*c*) Explain the factors influencing the choice of mix proportions ? 7

3. (*a*) What do you mean by fibers ? 2

(*b*) Describe briefly the structural irregularities. 5

(*c*) Write down short notes on any *two* : 7

(*i*) PVC

(*ii*) Cladding

(*iii*) Geo-synthesis.

4. (*a*) What is the unit of measurement of intensity of light ? 2

(*b*) Describe briefly different types of roller ? 5

(*c*) What do you mean by earthing ? Describe different types of earthing ? 7

5. (*a*) What is ventilation ? 2

(*b*) State general principles for central plants layout for hot water supply. 5

(*c*) Describe the different additional strengthening measures that are adopted in Masonry building for earthquake resistance ? 7

6. (*a*) What is retrofitting of structures ? 2

(*b*) Define any *two* : 5

(*i*) Acoustic material

(*ii*) Soil reinforcing

(*iii*) RPVC

(*c*) Describe different methods of ventilation. 7

7. (*a*) What is dragline ? 2

(*b*) Describe different earth-moving and compacting equipments indicating their specific uses. 5

(*c*) What are the sources of weakness in RCC framed building ? 7

STRUCTURAL DESIGN-II

(Code : CET-602)

Full Marks : 70 *Time* : 3 hours

Answer any **five** questions

Figures in the right-hand margin indicate marks

Steel Table and Code books are allowed which are related to this design i.e.-IS800-2007 & etc.

1. (*a*) What are the types of structural steel ? 2

   (*b*) Mention the advantages and disadvantages of using steel structures. 5

   (*c*) Find the maximum force that can be transmitted through a double bolted chain lap joint consisting of 6 bolts in 2 rows. Given that M_{16} bolts of grade 4·6 and plates of Fe_{410} are used. If the following datas are given,

   Thickness of plate $t_1 = 10$ mm, $t_2 = 12$ mm
   Diameter of bolt $d = 16$ mm, pitch $P = 60$ mm, Edge distance 'e' = 30 mm
   Width of the plate 'b' = 160 mm, $f_y = 250$ Mpa. 7

2. (*a*) Define the following term with diagram : 2

   (*i*) Pitch of the bolts
   (*ii*) Gauge distance
   (*iii*) Edge distance
   (*iv*) Staggered pitch.

   (*b*) A steel plate 200 mm × 12 mm is welded to a 10 mm thick gusset plate such that the overlap of the member is 300 mm. If fillet weld of size 6 mm is used for the connection, determine the design strength of the joint. Given that shop welding is to be done on three sides and grade of steel is Fe_{410}. 5

   (*c*) Design a lap joint for two plates of size 120 mm × 10 mm and 120 mm × 12 mm for maximum efficiency. Assume shop welding and Fe_{410} steel. 7

3. (*a*) Mention two disadvantages of welding. 2

   (*b*) A tension member consists of a flat 100 mm × 10 mm which is connected to a gusset plate 10 mm thick by 2 nos. of 16 mm diabolts. If steel of grade Fe_{410} and bearing bolts of property class 4·6 are used in the workshop, determine the strength of the flat against yielding, rupture and block shear. Also determine the maximum load the joint can carry safely. 5

   (*c*) Calculate factored axial load on the column section. ISHB 400 @ 806·38 N/M. The height of the column is 3·5 m 2nd it is pin-ended. Use steel of Fe_{410} grade. 7

4. (*a*) Define effective length and slenderness ratio of a column. 2

(*b*) Determine the plastic moment capacity and plastic modulus of the unsymmetrical 'I' section, whose top flange size 100 mm × 15 mm bottom-flange size 200 mm × 15 mm and web size is 200 mm × 15 mm. 5

(*c*) A column ISWB 300@471·8 N/m is to carry an axial factored load of 600 kN. M_{20} concrete is used for the foundation. Design the slab base. Provide welded connection between column and base plate. Given that the column end and the base plate are not machined for bearing. 7

5. (*a*) Why base plate is required below the column ? 2

(*b*) Determine safe axial load on a circular column of 200 mm diameter made up of deodar (HP) wood. Unsupported length of the column is 3·5 m being situated in outside location. 5

(*c*) A sal wood beam of standard grade carrying an all inclusive load of 20 KN/M is simply supported over masonry walls at both the ends. Design the beam for flexure, shear and bearing. Given that clear span = 4 m and inside location. 7

6. (*a*) What do you mean by decay in timber ? 2

(*b*) A tubular column consists of IS-1161 grade st. 35 steel the column is hinged at both the ends. The outside diameter of tube is 219·1 mm. The weight of 1·5 m length of the tube is 330 N. The length of column is 4 meter. Determine the safe load carrying capacity of the column. 5

(*c*) Design ground floor wall for a double storey building of the following specification only considering one room of size 6 m × 4 m with suitable doors and windows.

(*i*) Wall thickness = 230 mm
(*ii*) Clear height of walls in each floor = 3·00 mm.
(*iii*) Floor consists of 125 mm thick R_{CC} slab with 25 mm thick patent stone.
(*iv*) Roof consists of 125 mm thick R.C.C. slab with 125 mm line concrete over it .
(*v*) Live loads on floor and roof shall be 3 KN/m² and 1·5 KN/m² respectively. 7

7. (*a*) Define non-load bearing walls and explain by taking different types of non-load bearing walls. 2

(*b*) Design a solid circular deodar wood column for the following datas axial load on the column = 700 KN and effective length = 4 m (inside location). 5

(*c*) Design a column section (using channel section only) to carry a factored axial load of 500 KN. The column is 4 m long and is effectively held in position at both ends but restrained against rotation at one end only. Consider f_y = 250 N/mm². Assume wind and earthquake action. 7

ESTIMATING AND COST EVALUATION - II

(Code : CET-604)

Full Marks : 70 *Time* : 3 hours

Answer any **five** questions including **Q.No.6**.

Figures in the right-hand margin indicate marks

1. The dimension of a R.C.C slab is 4.00 m × 5.00 m × 15 cm deep. Reinforcement of 10 mm dia are placed in short span@15cm c/c. Of the total no of bars, 17 nos have been cranked and hooked at the ends. Other rods are straight and hooked at the ends. To hold the cranked portion 4 nos 8 mm dia straight and hooked rods have been used. The 8 mm dia rods are placed in a direction of long span @20 cm c/c and all are straight and hooked at the ends. The covers are 1.5 c.m at bottom and 3 c.m. on all sides. Assume any other dimension not given. Estimate the total weight of steel required for reinforcement of the slab. 14

2. Calculate the quantity of earthwork for a portion of road from the following data :

Chainage	50	51	52	53	54	55	56	57	58	59	60
Ground level(R.L)	132.1	132.2	131.9	132.2	131.8	131.7	131.6	131.4	130.1	130.5	130.7

The formation level at the chainage 50 is 131.0 m and the road is in a rising gradient of 1 in 200. The width of formation is 10 m and the side slopes are 1.5 : 1 in banking and 2 : 1 in cutting and the lateral slopes of the road is assumed as level. The length of one chain is 20 m. 14

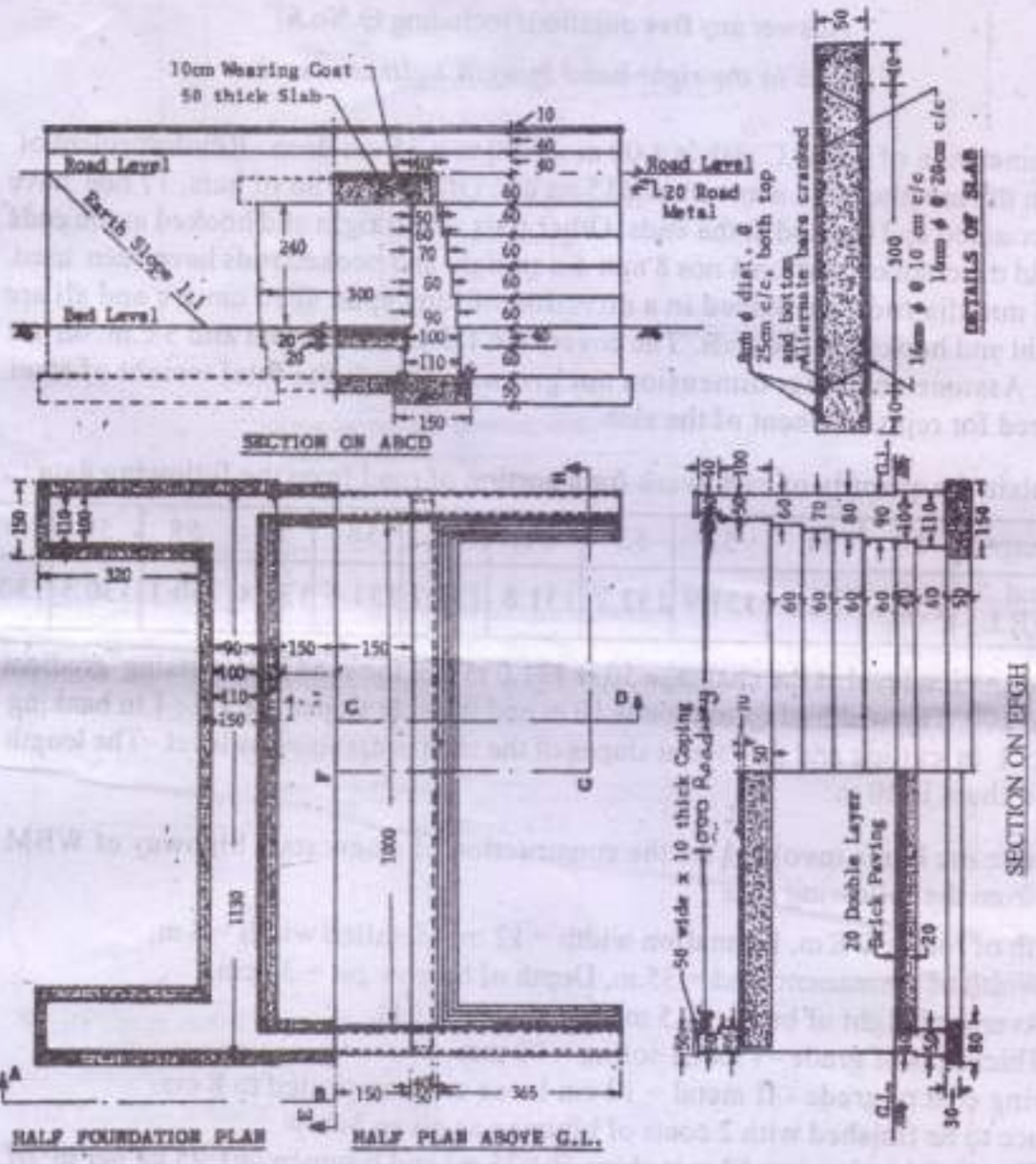
3. Estimate the items involved for the construction of a new state highway of WBM road from the following data : 14

Length of road = 2 Km, Formation width = 12 m, Metalled width = 8 m,
Width of permanent land = 35 m, Depth of borrow pit = 30 cm,
Average height of bank = 1.5 m(side slope = 2 : 1),
Thickness of grade - I metal soling = 90 mm
Wearing coat of grade - II metal = 12 cm loose and compacted to 8 cm.
Surface to be finished with 2 coats of bitumen as given below.
First finishing coat = 12 mm chips @.025 m^3 and bitumen @1.25 kg per m^2 of road surface.
Second finishing coat = 6 mm chips @0.020 m^3 and bitumen @1.24 kg per m^2 of road surface. Consumption of fuel @0.45 kg per kg of bitumen.

4. Prepare a quantity estimate for the following items of works of the slab culvert given in figure 1.
   (*a*) Earthwork in excavation. 4
   (*b*) Cement concrete in foundation. 2

(*c*) 1st class brick work in cement mortar. 4

(*d*) Cement plastering over brickwork in cement mortar. 4



ALL DIMENSIONS IN CENTIMETRE

Figure - 1

5. Prepare a quantity estimate for the following items of works of a drainage siphon given in figure 2 and 3.

(*a*) Earthwork in excavation. 4

(*b*) Cement concrete in foundation. 2

(*Continued*)

(c) 1st class brick work in cement mortar. 4

(d) Cement plastering over brickwork in cement mortar. 4

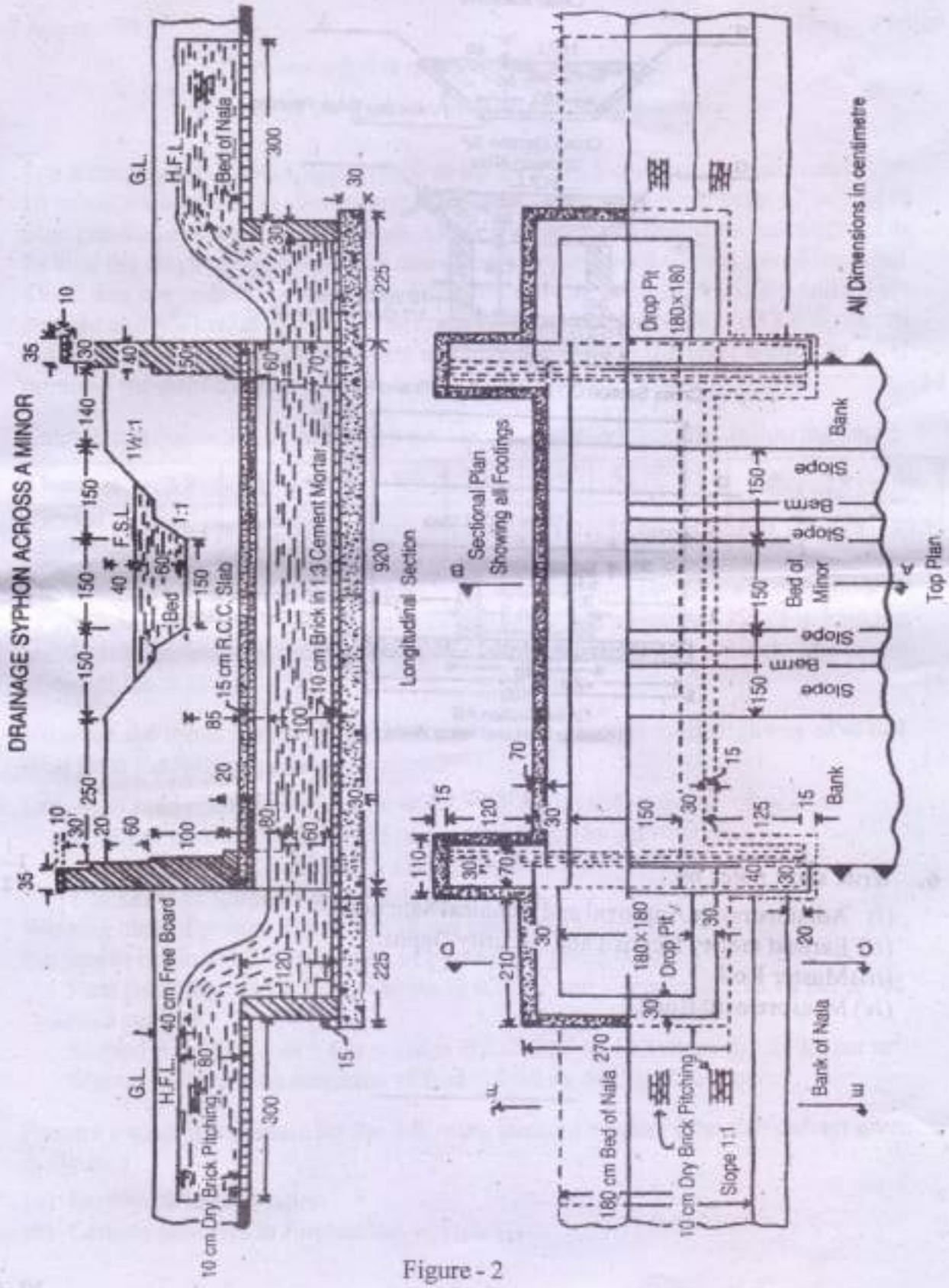


Figure - 2

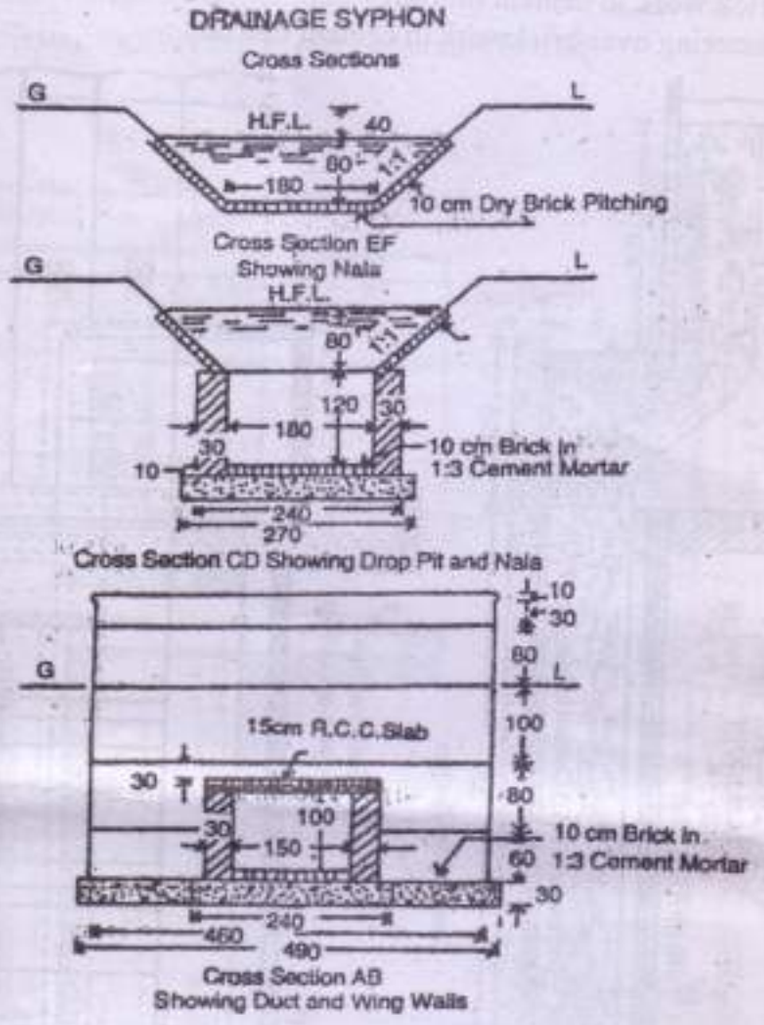


Figure - 3

6. Write short notes on : $3\frac{1}{2} \times 4$

(*i*) Administrative Approval and technical Sanction
(*ii*) Earnest money Deposit and Security Deposit
(*iii*) Muster Roll
(*iv*) Measurement Book.

VI- SEM CIVIL / 2019(W)

CET 601 CONSTRUCTION MANAGEMENT

Full Marks: 80 Time : 3 Hours

Answer Any five Questions including Q.No. 1 & 2.

Figures in the right hand margin indicates marks

1. Answer all questions. 2x10

(a) What do you mean by work study .
(b) Define earliest event time .
(c) Write two limitations of bar chart.
(d) Define pessimistic time.
(e) What do you mean by quality control.
(f) Write any 5 functions of costruction management.
(g) What are the construction team components.
(h) Define material schedule.
(i) What do you mean by bar chart .
(j) What do you mean by piece rate or piece work system.

2. Answer any six Questions. 5x6

(a) What are the characteristics of labour and explain it.
(b) Describe the causes of accidents in costruction.
(c) Describe about the resources of construction management.
(d) Describe the stages of construction planning.
(e) What are the advantages and disadvantages of line and staff organization.
(f) What are the type of motivation used in labour management.
(g) What are the maintenances used in equipments of construction.

3. Describe the Safety measures required for demolition, fabrication and erection. 10

4. The following information applies to a particular project. 10

Event A is the initial event.
Event B is preceded by event A.
Event D is preceded by event B.
Event E is preceded by event D.
Event C is preceded by event B.
Event D is preceded by events C and B.
Event E is preceded by events D and B.
Event F is preceded by event E.
The expected time for various activities is as follows.

Activity	A-B	B-D	B-C	C-D	B-E	D-E	E-F
Duration	3	16	6	8	10	5	3

(i) Draw the network diagram of the project .
(ii) Calculate the critical path.

5. What do you mean by construction management and describe the factors affecting the construction management. 10

6. What are the conflicts in organization ? Discuss the genesis of conflicts and types of conflicts. 10

7. Explain the importance of leadership and human relations in managing a construction project. 10

VI- SEM/CIVIL/2019(W)

CET-602-STRUCTURAL DESIGN-II

Full Marks: 80 Time: 3 Hours

Answer any Five Questions including Q No. 1& 2

Figures in the right hand margin indicates marks

1.	Answer ALL the questions. (a) Write down the different types of steel structures. (b) Define hardness. (c) Define pitch of the bolt. (d) Write down the types of welded joints. (e) Define slenderness ratio. (f) A steel plate 25 cm wide & 12 cm thick, if the diameter of the bolt hole is 20mm, calculate net sectional area of the plate. (g) What is the maximum deflection in the beam as per IS:800? (h) What is the function of column base? (i) What are knots in timber? (j) Define Buttress walls.	2X10
Q.2	Answer any SIX questions. (a) Write down advantages and disadvantages of steel structure. (b) A tie member consists of 2 ISMC 250. The channels are connected on either side of a 12 mm thick gusset plate. Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400 mm. (c) Explain different modes of failure of tension member. (d) Determine the axial load capacity of the column ISHB 300 @ 577 N/m if the length of column is 3m & it's both end pinned. (e) Design a slab base for a column ISHB 300 @ 577 N/m carrying an axial factor load of 1000 KN. M20 concrete is used for the foundation. Provide welded connection between column & base plate. (f) Determine the load carrying capacity of a strut made with 2 ISA 75× 75, 6mm, back to back if the length member is 3m & welded to a 12 mm gusset plate. (g) Discuss about long term deformation in timber.	5X6
Q.3	Design a single bolted double cover butt joint to connect boiler plates of thickness 12 mm for maximum efficiency. Use M16 bolts of grade 4.6. Boiler plates are Fe 410 grade. Find the efficiency of the joint.	10
Q.4	A column 4m long has to support a factored load of 6000 KN. The column is effectively held at both ends & restrained in direction at one of the ends. Design the column using beam section and plates.	10
Q.5	Design a simply supported beam of effective span 1.5 m carrying a factored load concentrated load of 360 KN at mid span.	10
Q.6	Calculate the moment carrying capacity of laterally unstrained beam mode of ISMB 400 & length of member is equal to 4m. Assume necessary suitable data.	10
Q.7	Write short notes on (a) Web crippling & web buckling (b) Block shear.	5x2

VI- SEM/CIVIL/2019(W)/(NEW)

CET-603-RAILWAY AND BRIDGE ENGINEERING

Full Marks: 80 Time : 3 Hours

Answer any Five Questions including Q No. 1& 2

Figures in the right hand margin indicates marks

1.	Answer ALL the questions:	2X10
a	Write two advantages of railway.	
b	Write the term used for distance between running faces of rails.	
c	Define sleeper.	
d	Define turnouts.	
e	What do you mean by bridge?	
f	What do you mean by skew bridge?	
g	Differentiate between square alignment and skew alignment.	
h	What is a cofferdam?	
i	What do you mean by load carrying capacity of piles?	
j	What is an approach road for a bridge?	
2.	Answer any SIX questions:	5X6
a	Describe the various factors which affect the length of rail.	
b	If the rulling gradient is 1 in 150 on a particular section of Board Gauge and at the same time a curve of 4 degree is situated on this rulling gradient, what would be the allowable rulling gradient?	
c	Explain crossings and various parts of crossings.	
d	Explain points of switches.	
e	What do you mean by Afflux and explain Marriman's formula?	
f	Explain the ideal bridge site characteristics?	
g	Differentiate between pipe culvert and box culvert?	
3.	What are the factors governing the selection of Gauge? Explain in details.	10
4.	Write down about the various classifications of sleepers.	10
5.	Describe in details the requirements of an ideal permanent way.	10
6.	Explain the maintenance of track and advantages of good maintenance.	10
7.	What do you mean by pile driving? Describe the various hammers used in pile driving?	10

VI- SEM CIVIL/2019(W)/ (New)

CET 604 -ESTIMATION & COST EVALUATION-II

Full Marks: 80 Time : 3 Hours

Answer any FIVE Questions including Q No. 6

Figures in the right hand margin indicates marks

1. Calculate the quantity of earthwork for a portion of a road under construction from the following data: 15

R.D.	1500.0	1530.0	1560.0	1590.0	1620.0	1680.0	1710.0	1740.0	1770.0	1800.0
N.S.L.	141.2	141.3	141.0	141.3	140.9	140.7	140.5	139.2	139.6	139.8
Formation Level	140.1	←----------Rising gradient of 1 in 200----------→								

The width of formation is 10 m and the side slopes are 2:1 in cutting and width of formation is 8 m and the side slopes are 1.5:1 in banking.

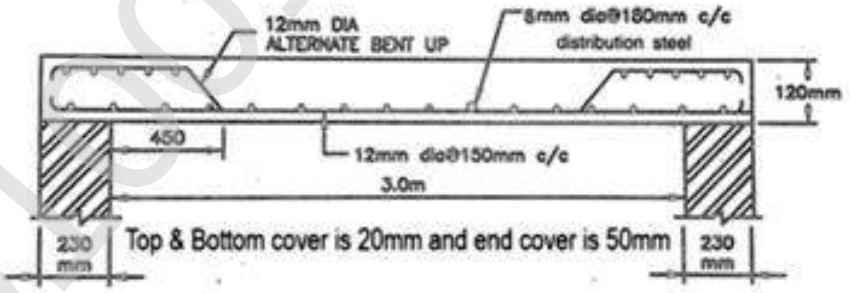
2. Estimate the quantities of different items involved for the construction of a new WBM road from the following data: 15

Length of the road = 6 Km, Formation width = 10 m, Metalled width = 8 m,
Thickness of grade-I metal soling = 100 mm
Wearing coat of grade-II metal = 120 mm loose compacted to 80 mm
Surface finishing is as follows:
1st coat of finishing = 12 mm chips @ 0.020 m^3 and bitumen @ 1.20 Kg per m^2 of road surface.
2nd coat of finishing = 6 mm chips @ 0.018 m^3 and bitumen @ 1.25 Kg per m^2 of road surface.
Fuel consumption = @ 0.50 Kg per Kg of bitumen.

3. Estimate the quantities of the following items of works of a canal fall given in figure-I
   (a) Earthwork in Excavation in hard soil 5
   (b) Stone Masonry work in C.M. (1:4) 5
   (c) Pointing work in C.M. (1:6) 5

4. Estimate the quantities of the following items of works of a slab culvert given in figure-II
   (a) Earth work in Excavation in hard soil 5
   (b) Cement concrete in foundation in C.C. (1:3:6) 3
   (c) 1st Class Brick masonry work in C.M. (1:6) up to slab 7

5. A room has a clear dimension of 3 m X 7 m. It has a RCC slab as shown in figure below. Estimate the quantities of following items.



   (a) Cement concrete (1:1.5:3) 2
   (b) Centering & Shuttering 2
   (c) Weight of 6 mm & 12 mm dia bars including 10% wastage 8
   (d) Prepare a bar bending schedule 3

6. Answer any FOUR questions 4x5
   (a) Write down about classification of works briefly
   (b) Differentiate between Muster Roll & Acquittance Roll
   (c) Write down a Notice inviting Tender for construction of a new bridge over a river
   (d) Describe about procedure for verification of stock
   (e) Write down the various payment process to a contractor adopted by department

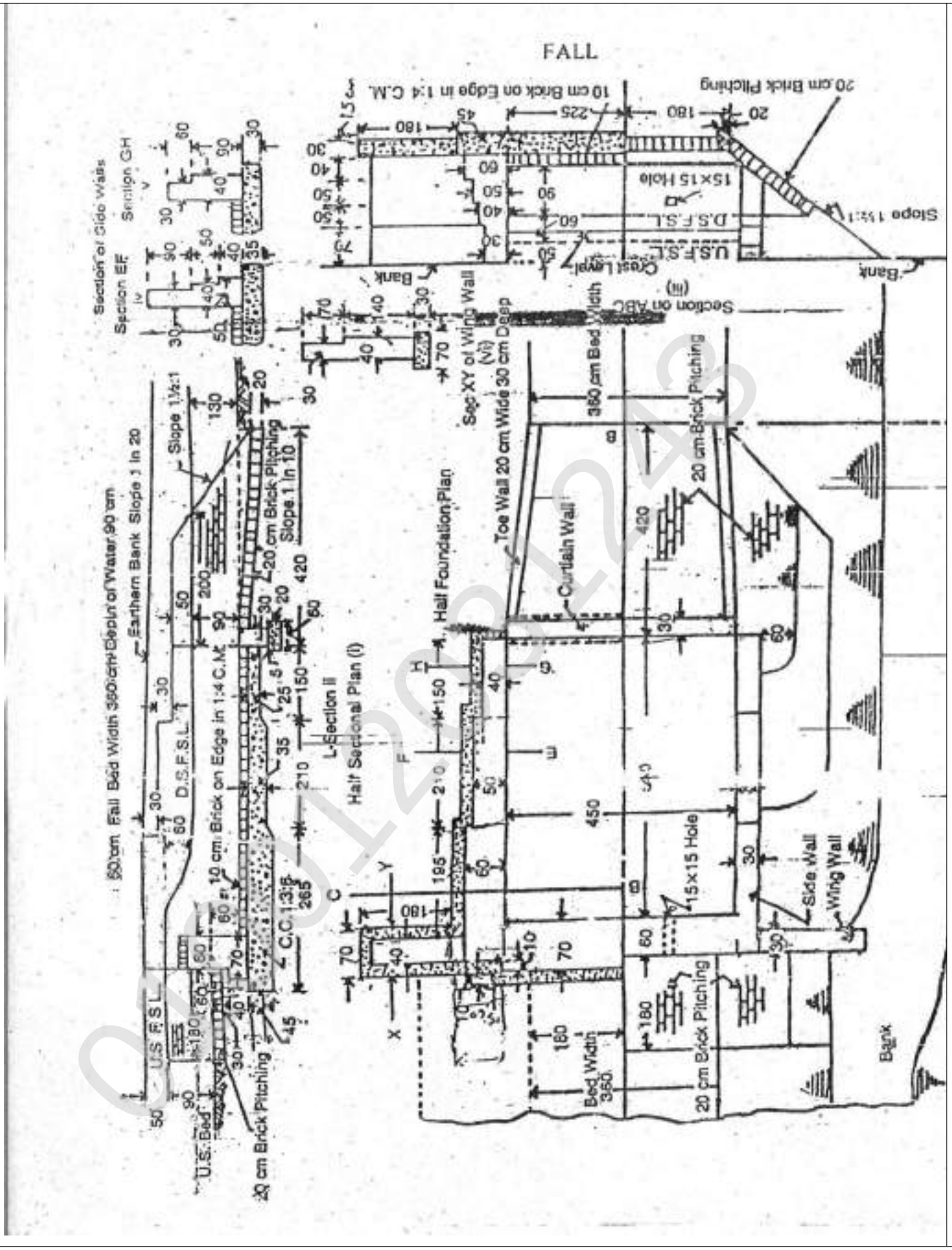

FALL
Section of Side Walls
Section EF
Section GH
Earthern Bank Slope 1 in 20
Slope 1½:1
Slope 1 in 10
20 cm Brick Pitching
10 cm Brick on Edge in 1:4 C.M.
D.S.F.S.L.
U.S.F.S.L.
C.C. 1:3:6
U.S.R.S.L
U.S. Bed
Half Sectional Plan (I)
L-Section II
Half Foundation Plan
Toe Wall 20 cm Wide 30 cm Deep
Curtain Wall
Sec XY of Wing Wall (Vi)
Section on ABC (iii)
360 cm Bed Width
15×15 Hole
Side Wall
Wing Wall
Bed Width 350
Bank
Slope 1½:1
20 cm Brick Pitching
10 cm Brick on Edge in 1:4 C.M.
15×15 Hole
Bank

Figure -I

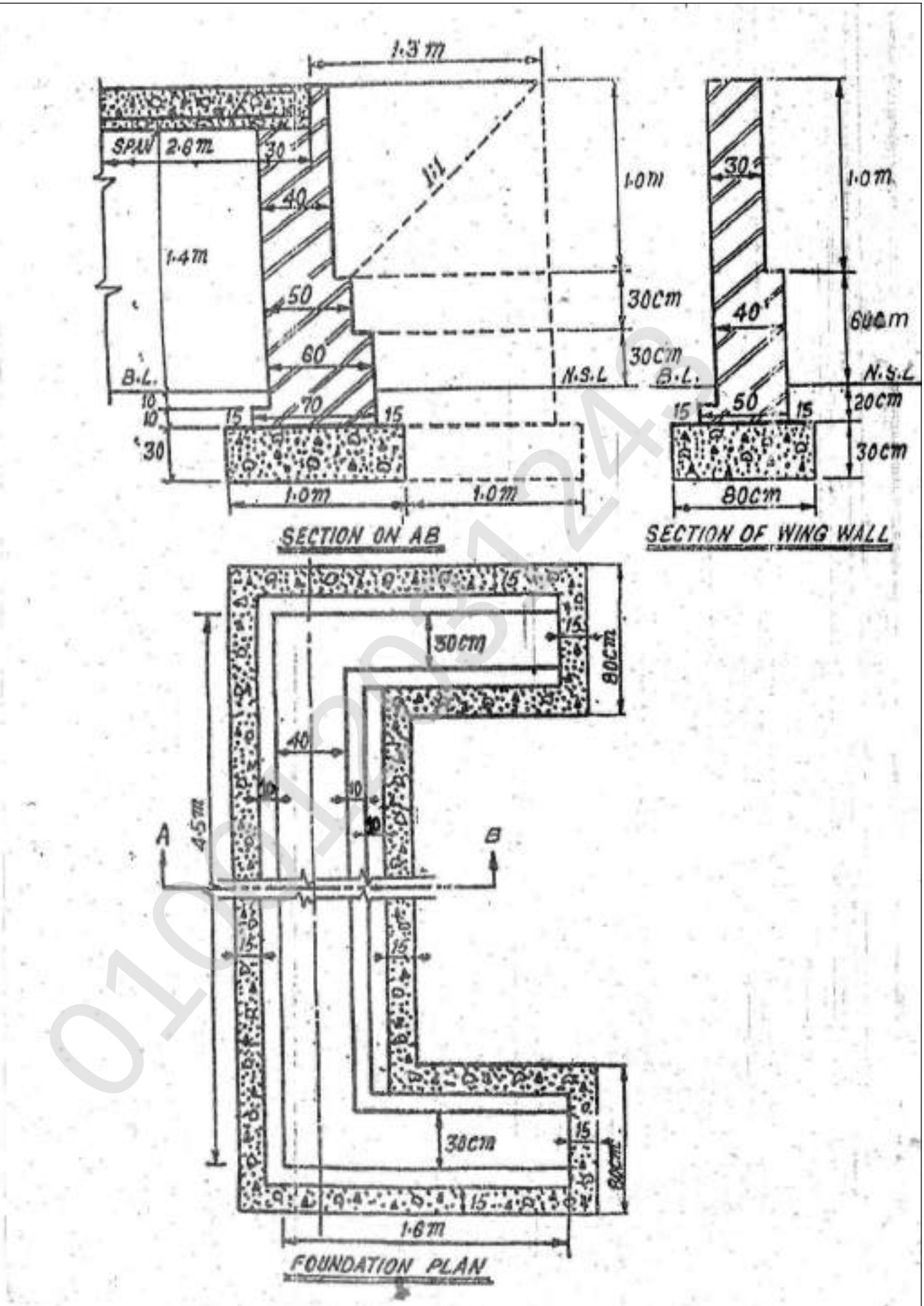

1.3 m
SPLW 2.8 m
30
1:1
1.0 m
40
1.4 m
50
30 cm
60
B.L.
N.S.L
30 cm
10
10
30
15
70
15
1.0 m
1.0 m
SECTION ON AB
30
1.0 m
40
60 cm
B.L.
N.S.L
15
50
15
20 cm
30 cm
80 cm
SECTION OF WING WALL
15
30 cm
80 cm
40
10
10
30
A
B
4.5 m
15
15
30 cm
80 cm
1.6 m
FOUNDATION PLAN

Figure - II

VI- SEM CIVIL / 2019(W) / (New)

CET 605 – E(iii) ADVANCE CONSTRUCTION TECHNIQES AND EQUIPMENTS

Full Marks: 80 Time : 3 Hours

Answer any FIVE Questions including Q No. 1 & 2

Figures in the right hand margin indicates marks

1. Answer **ALL** questions 2x10
   (a) What do you mean by curing of concrete?
   (b) What do you mean by target strength in concrete mix-design?
   (c) Define workability of concrete.
   (d) What do you mean by reinforcing?
   (e) What do you mean by fibres?
   (f) What do you mean by Earthquakes?
   (g) Define retrofitting of structures.
   (h) How the intensity of light is measured?
   (i) What do you mean by building configuration?
   (j) What are the functions of bulldozers and dragline?

2. Answer any **SIX** questions. 5x6
   (a) What are the different properties and uses of artificial timber ?
   (b) What are the systems and problems on ventilation? Describe with sketches.
   (c) Write the advantages and disadvantages of prefabrication.
   (d) What are the electrical service requirements in high rise building?
   (e) What are the sources of weakness in RCC framed building?
   (f) State different plan configuration problem.
   (g) Describe briefly how plastics are used in construction of structures.

3. Classify retrofitting techniques and describe their uses. 10

4. Describe different earth moving and compacting equipments indicating their specific use with suitable sketches. 10

5. Discus about the building characteristics in earthquake resistance construction. 10

6. What do you mean by earthing? Describe the process and advantages of earthing. 10

7. Write short notes on. 2.5x4
   (a) Micro silica
   (b) Soil Reinforcing
   (c) Acoustic material
   (d) Geo-synthesis