BALASORE SCHOOL OF ENGINEERING

SUBJECT - **ESTIMATING II**

CODE - (TH-05)

BRANCH - **CIVIL**

PREPAIRED BY – S.L.ROUT

CHAPTER – 1

(1)Q.   What is minor and major bridge ?   [2016(s), 1(vii)]

Ans: According to IRC specification structures having linear water way above 6m but below 30m are minor bridges and structures having a linear waterway more are major bridges.

(2)Q.   What is certain wall?   [2017(s),1(xi)]

Ans: Cross wall are built across the stream on upstream or downstream in order to protect the structure from erosion due to strong current of water induced by restriction of free passage of water way.

(3)Q.   What is drop pit?   [2017(s), 1(i)]

Ans: Vertical sloping wall placed at inlet headwall of a culvert to minimize the gradients. Also known as drop pit.

(4)Q.   What is skew culvert ? [2016(s), 1(vi)]

Ans: If a culvert is not oriented perpendicular to the flow lines going through the culvert is called skew culvert. Skew angle based on angle of flow path as it goes through bridge compare with a line.
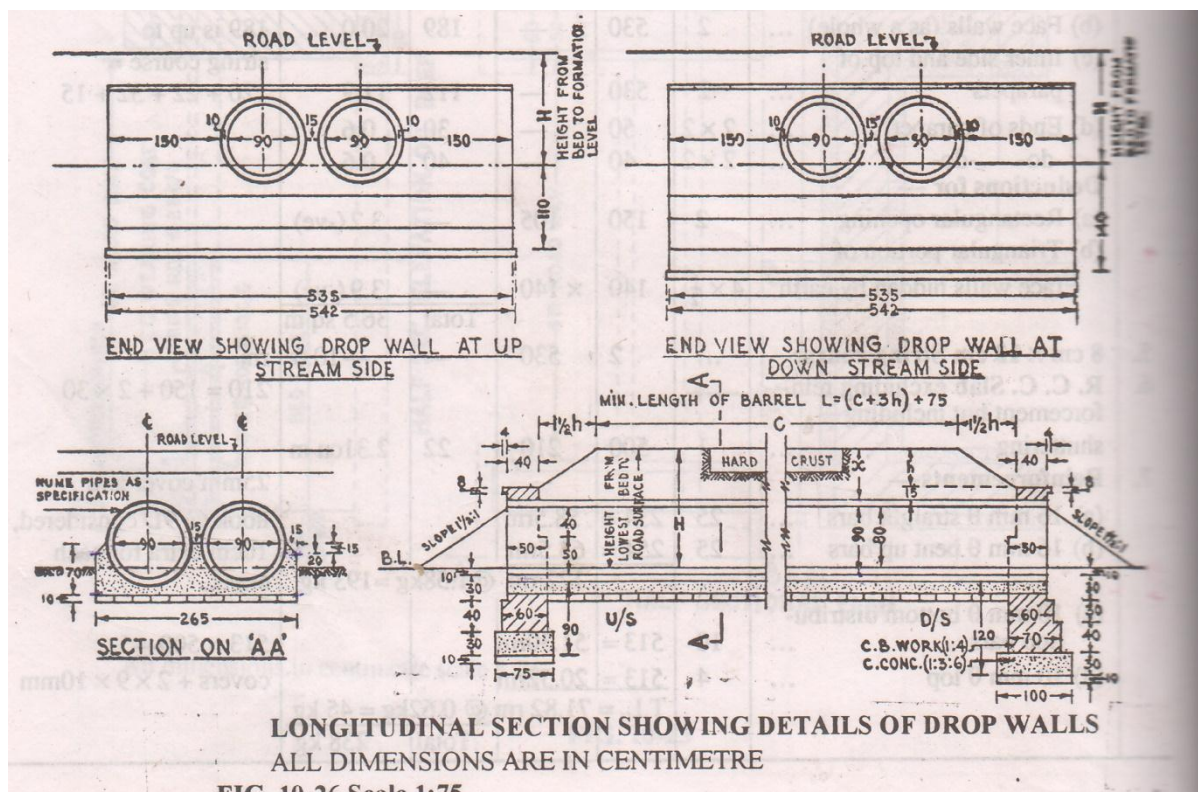
(5)Q.   What is kerb in culvert?   [2016(s),1(v)]

Ans: The kerb is the edge where a raised side pavement or road central reservation meets a road way.

LONG QUS(15 MARKS)

(1)Q. **Prepare the detail quantity estimate for a barrel 0730 cm length (total length depends on the bank height) and the drop walls. For a 90 cm dia double barrel Hume pipe culvert in the estimate, the earth cushion whose depth has been indicated by x= 60 cm minimum and extra earthwork in excavation shall be considered in the estimate to provide a side slope 07 1:2 in order to prevent collapsing of earthwork at water level.[2017(s) (5)]**

INSERT FIGURE

END VIEW SHOWING DROP WALL AT UP STREAM SIDE

END VIEW SHOWING DROP WALL AT DOWN STREAM SIDE

SECTION ON 'AA'

LONGITUDINAL SECTION SHOWING DETAILS OF DROP WALLS
ALL DIMENSIONS ARE IN CENTIMETRE

FIG. 10.26 Scale 1:75

Sl. No	Description of item	No	L. cm.	B. cm.	H. cm.	Qty	Total	Explanatory notes
	(A) for 30 cm length of Barrel							
1.	Earthwork in excavation	1	30	310	45	0.418	0.418 cu m	310=265+2×45/2 Extra work for a side slope of 1:2 to prevent
2.	Earthwork in filling and ramming complete	2	30	45/2	45	0.061	0.061 cu m	Collapsing of earth at water level
3.	Single brick flat soling…	1	30	265	–	0.795	0.795 sq m	
4.	Cement concrete (1:3:6) with brick ballast (considering whole first)	1	30	265	55	0.437		55=70-15
	Chamfering portion	1	30	265	55	0.437		250=1/2 (265+265–30)
	Deduction of pipes	2	30×1/2	π ×1/2	$(110)^2$	0.133	(–ve) 0.417 Cu m	
5.	90 cm dia.10 cm thick Hume pipe	2	30	–	–	0.60	0.60m	
6.	Shuttering for concrete..	2	30	–	70	0.42	0.42 sq m	
(B)	<u>Quantities for drop walls</u>							
1.	Earthwork in Excavation							
	Up-stream side	1	662	195	120	15.49		Extra excavation to provide a side slope of 1:2 all round 195=75+2×1/2 (10+90)
	Down Stream side	1	692	250	150	25.95	41.44 cu m	
2	Earthwork in filing	=	Item(1) and upto 41.44-0.9	Items portion G.L. 4-2.81	(3),(4) of work from(5) -5.88	=31.81	31.81 cu m	All the items are form sub-head (B)
3	Single brick flat soling U/S side D/S side	1 1	535 535	75 100	– –	4.01 5.35	9.36 sq m	0.94=9.36×0.1
4.	Cement Concrete(1:3:6) with brick ballast U/S side D/s side	1 1	535 535	75 100	30 30	1.20 1.61	2.8	Cu m

Sl. No	Description of item	No	L. cm.	B. cm.	H. cm.	Qty	Total	Explanatory notes
5.	First class brickwork in <u>cement mortar (1:4)</u>							
	U/S side for-							
	60 cm layer	1	535	60	40	1.28		80=30+50
	50 cm layer	1	535	50	80	2.14		65=40+10+15
	40 cm layer	1	535	40	65	1.39		
	D/S side for							
	70 cm layer	1	535	70	40	1.50		
	60 cm layer	1	535	60	30	0.96		
	50 cm layer	1	535	50	80	2.14		
	40 cm layer	1	535	40	65	1.39		
	Deductions for Pipe openings both U/S Amd D/S sides	2×5	$\pi \times 110^2/4$	× 45	(av)	1.71	(-ve)	45=(50+40)/2
	Concreting under pipes	2	50×	0.417	Cum /rm	<u>0.42</u>		(-ve)
						8.67	8.67 Cu m	
6.	12 mm cement plaster (1 : 2)							
	U/S and D/S faces Up to 15 cm below G.L.	2	535	–	120	12.84		120=80+10 +15+15
	Tops Deductions for pipe Openings	2	525	40	–	4.20		
		2×2	$\pi \times 110^2/4$	–	–	3.80	<u>(–ve)</u> 13.2 Sq m	
7.	Shuttering for concrete							
	Work in foundation	2×2	535	–	30	6.42	6.42 Sq m	
8.	String course at top	2	535	–	–	10.7	10.7 rm	

(2)Q. **Prepare a quantity estimate for the following items of work of slab culvert.2019-w-q-4-a-b-c**

    (a) **Earth work excavation.**   **(4)**

    (b) **Cement concrete in foundation**   **(2)**

    (c) **1ˢᵗ clsss brick work in cement mortar (1:4)**   **(6)**

    (d) **cement plastering over brick work in**

        Cement mortar (1: 3)   **(4)**
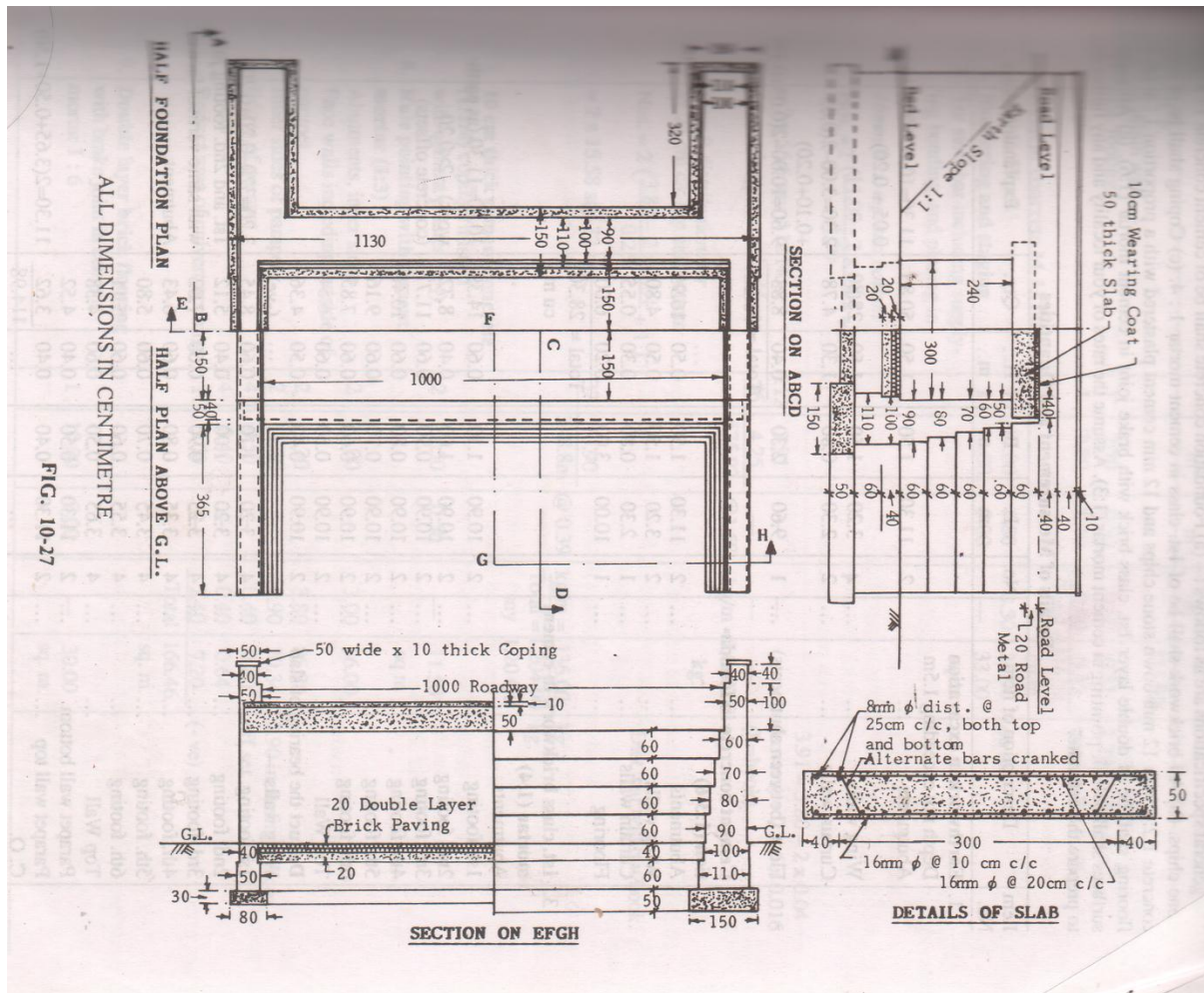
FIG. 10-27

HALF FOUNDATION PLAN

HALF PLAN ABOVE G.L.

ALL DIMENSIONS IN CENTIMETRE

SECTION ON ABCD

SECTION ON EFGH

DETAILS OF SLAB

Sl. No	Description of item	No	L. cm.	B. cm.	H. cm.	Qty	Explanatory notes
A	Earth work in excavation depth not exceeding 1.5m abutments	2	11.30	1.50	1.50	50.85	11.30=10+2(.40+ 0.5+.20)
	Wing walls	4	3.20	1.50	1.50	28.80	2.30=3.00-
	curtain walls	2	2.30	.80	1.30	4.78	2(0.05+0.10+.20)
	floor	1	9.60	2.30	.40	8.83	9.60=10.00 -
							2(0.5+.15)
						93.26m³	
B	Cement concrete in foundation (1:3:6)						
	Abutment	2	11.30	1.50	.50	19.95	
	Wing walls	2	3.20	1.50	.50	4.80	
	Curtain walls	1	2.30	.80	.30	.55	
	Flooring	1	10.00	3.00	.20	6.00	
						28.30m³	
c.	1st class brick work in cement mortar(1:4) Abutment						
	1st footing	2	10.90	1.10	.60	14.39	10.90=11.30
	2nd footing	2	10.90	1.00	.40	8.72	−2×.20
	3rd footing	2	10.90	.90	.60	11.77	Concrete offset
	4th footing	2	10.90	.80	.60	10.46	
	5th footing	2	10.90	.70	.60	9.16	
	6th footing	2	10.90	.60	.60	7.85	
	Top wall deduction	2	10.90	.50	.60	6.54	
	Parapet wall bottom	2	11.30	.5	.4	4.52	11.30=
	Parapet wall top	2	11.30	.4	.4	3.62	2(3.65+.5+1.5)
	Curtain wall						
	1st footing	1	2.7	.5	.6	.81	2.7=2.3
							+2(.2)
	Top wing walls	1	2.8	.4	.4	.45	
	1st footing	4	3.2	1.1	.6	8.45	
	2nd footing	4	3.2	1.0	.4	5.12	3.2=3.2–.2+.2
	3rd footing	4	3.25	.9	.6	7.02	
	4th footing	4	3.35	.8	.6	6.43	
	5th footing	4	3.45	.7	.6	5.80	
	6th footing	4	3.55	.6	.6	5.11	
	Top wall	4	3.65	.5	.6	4.38	
	bearing of slab	2	10.9	.4	.5	4.36	
						Total 116.24 m³	

Sl. No	Description of item	No	L. cm.	B. cm.	H. cm.	Qty	Explanatory notes
D	Pointing with cement mortar (1 : 3)						
	Abutment innersides	2	11.0	–	3.0	66.0	
	Face wall including out side of parapet	2	11.3	–	3.8	85.88	
	Inner side of parapet	2	11.3	–	.9	20.34	
	Edge of parapet	4	.5	–	.4	.80	
	– Do –	4	.4	–	.4	.64	
	Deduction area of culvert opening	1	3	–	2.4	<u>7.20(–)</u>	
						166.46m^2	

(3) Q.   Estimate the quantities of following item for a simple slab culvert from the drawing in fig.2019-w-q-4

(i)   Earth work in excavation

(ii) C.C. (1 : 3 : 6) in foundation

(iii) 1st class K.B. brick masonry

(iv) Cement Pointing.

R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks
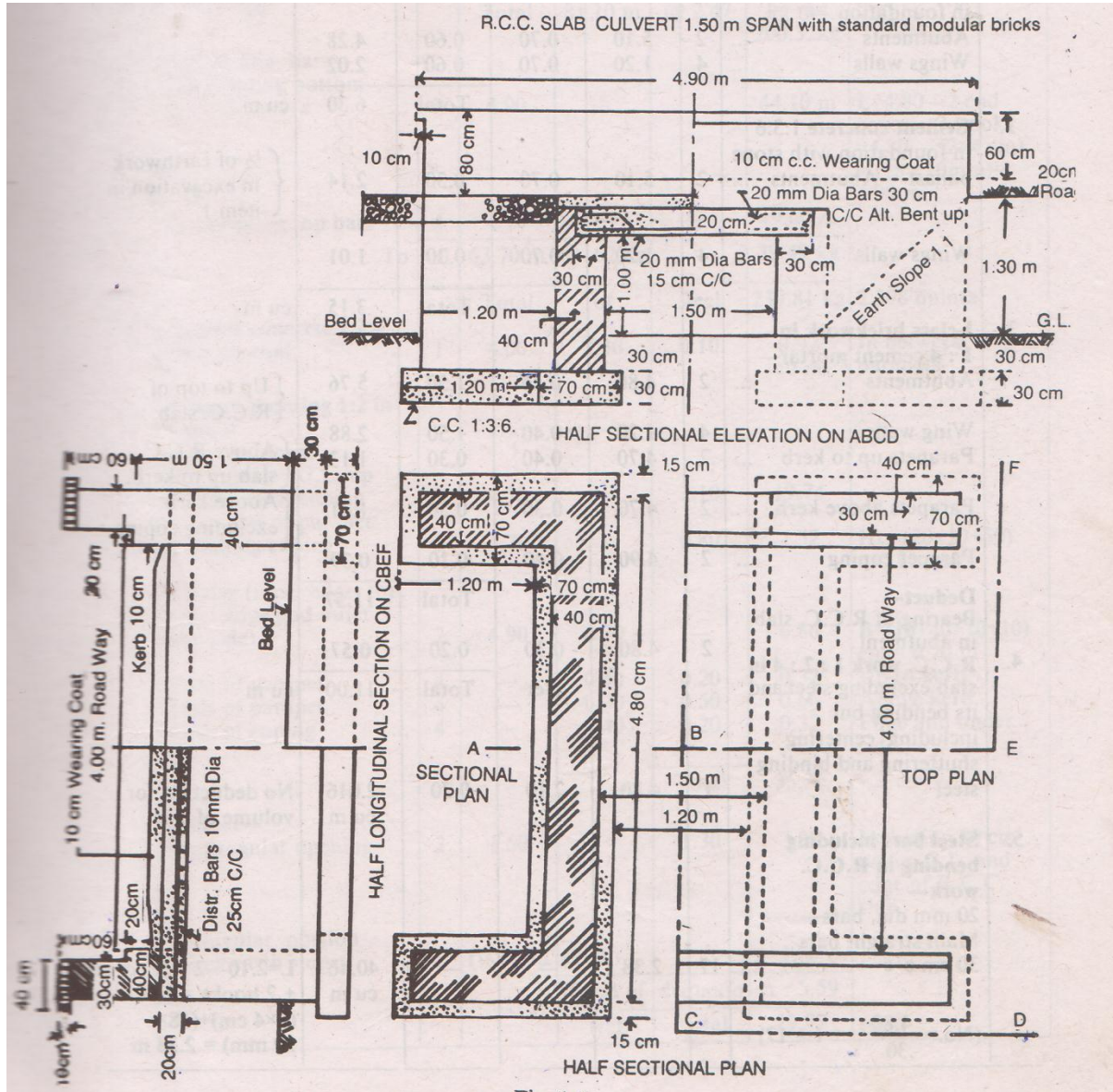
Sl. No	Particulars of items of work	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
i)	Earth work in excavation For foundation Abutments	2	5.10	.70	.60	4.28	
	Wing walls	4	1.20	.70	.60	2.02	
ii)	Cement concrete 1:3:6 in foundation Abutments	2	5.10	.70	.30	6.30m³ 2.14	
	Wing walls	4	1.20	.70	.30	1.01	
iii)	1 class brick work in 1:4 cement mortar Abutments	2	4.80	.40	1.50	3.15m³ 5.76	
	Wing walls	4	1.20	.40	1.50	2.88	
	Parapet upto Kerb	2	4.70	.40	.30	1.13	
	Parapet above Kerb	2	4.70	0.30	0.50	1.41	
	Parapet coping	2	4.90	.40	.10	.39	
	Deduction bearing of r.c.c. slab	2	4.80	.30	.20	.57(-ve)	
iv)	Cement pointing 1:2 in walls					11.00m³	
	Face wall from 10 cm below G.L up to bottom of coping	2	4.70	–	2.10	19.74	
	Innerside of parapet excluding coping	2	4.70	–	.80	7.52	Ht=20+10+50 = .80mm
	Coping (inner edge, top outer edge and side)	2	4.90	.70	–	6.86	B=10+40+10+10 =.70m
	Ends of parapet	4	–	.40	.20	.32	
	Ends of parapet	4	–	.30	.50	.60	
	Ends of coping	4	–	.40	.20	.32	
	Deduct:⟹					35.36m²	
	Rectangular opening	2	1.50	–	1.30	3.90	
	Triangular portion below earth slope	2	½×1.30 ×1.30			1.69 29.77m²	

(4)Q. **Estimate**

a) **The quantity of steel including 10 % wastage**

b) **Quantity of binding wire**

c) **Quantity of steel per m³ of concrete**

From the following data of RCC slab 4m × 4.5 m × 12 cm thick, 8 mm dia rods are placed in short span @ 20 cm cc with one side 45° crank with end hools rods are placed in long span @ 25 cm c/c with one side 45° crank with end hooks 8mm dia straight bars with end hooks 6 nos. along span and 6 nos along short span have been used. Cover 25 mm and k = 2

[2016 (s) (6)]

Ans: Volume of concrete :-

=4m × 4.5 m × 12 cm

=4m × 4.5m × .12 m

= 2.16 m

Size of Bar and position	Overall Length cm	Extra length		Less Cover c.m.	Actual length m	No.of bar	Total length m
		Crank .42D cm	Hook 9D c.m.				
8 mm rod in short span @ 20 m c/c	400	1×.42×10=4.2	2×9×.8 =14.4	2× 2.5 =5	4.14	445/20 ×1=24 -6=18	25
8mm st. bar along short span	400	–	14.4	5	4.09	6	25
8 mm rod in long span @ 25 cm c/c	450	4.2	14.4	5	4.63	395/25 +1=17 −6=11	51
8m st. bar along long span	450	–	14.4	5	4.59	6	27
						Total = 178 kg	

.42 kg per 1 m length of 8 mm dia bar.

For 178 m length bar

$$= 178 \times .42 = 74.76 \text{ kg}$$

(i) The quantity of steel including wasting @ 10 %

$$= 74.76 + (74.76 \times 10/100)$$

$$= 82.24 \text{ kg}$$

(ii) Quantity of binding of wire for 10 m^2 slab = 2.7 kg wire

$$1m^2 = 2.7/10$$

For (4×4.5) m^2 slab

$$= 18 \times (2.7/10) = 4.86 \text{ kg}$$

(iii) For 2.16 m^3 concrete slab required 178 kg bar

For 1 m^3 concrete slab required $= 178/2.16 = 82.40$ kg

CHAPTER : 2

SHORT QUS(2 MARK)

(1)Q.   What is siphon ?   [2016, (1-xiii)]

Ans: A tube used to convey liquid upwards from a reservoir and then down to a lower level of its own accord. Once the liquid has been forced into the tube, typically by suction or immersion, flow continues unaided.

LONG QUS

(1)Q.   Find a detailed estimate of siphon aqueduct from the given fig. The general specification C.C in foundation 1 : 3 with brick ballast. Brick wall shall be 30 cm thick dry brick pitching and shall be provided both V/S and DS sides.2018(w)q-3,[2016(s), (2)]
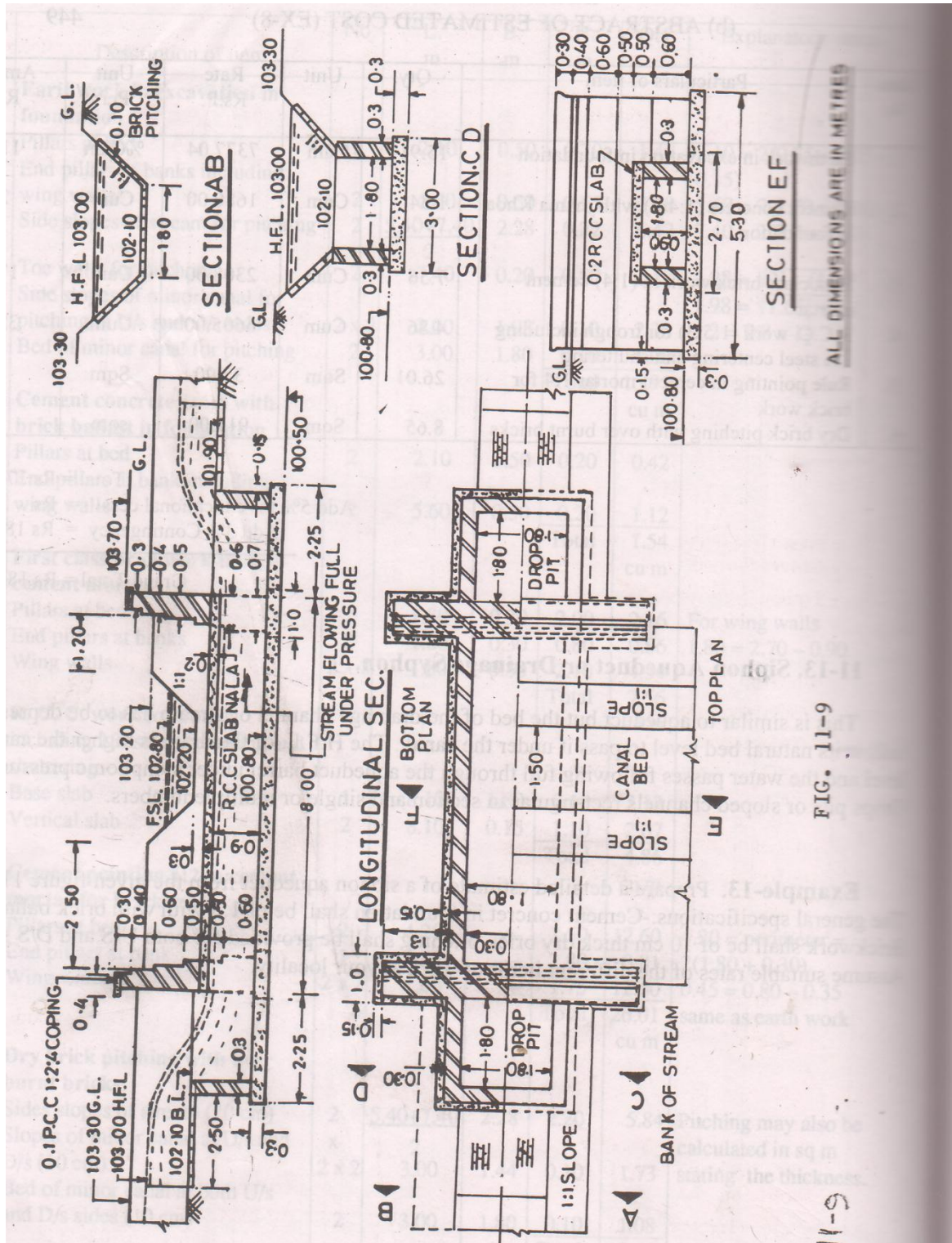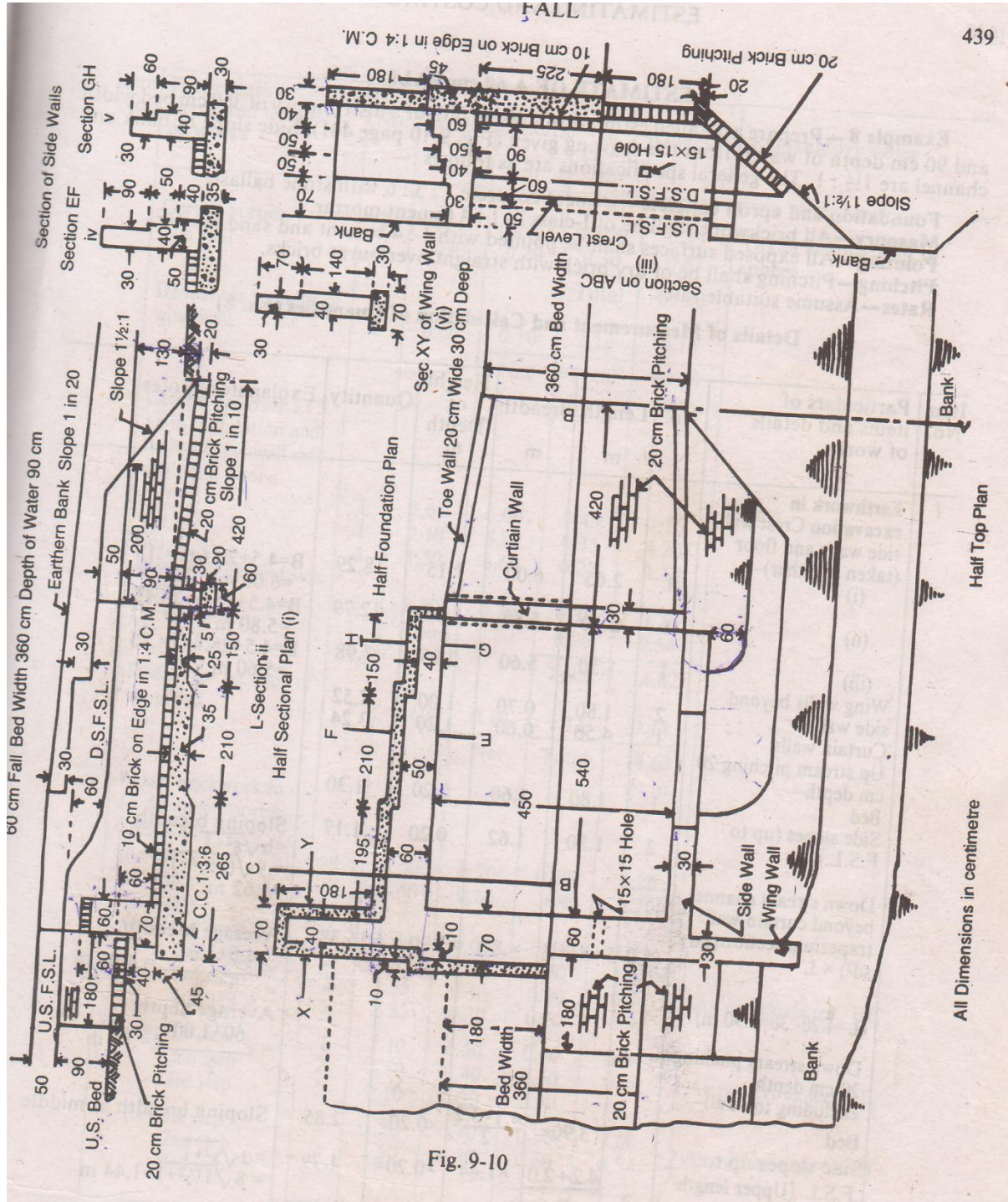
FIG. 11–9

ALL DIMENSIONS ARE IN METRES

Sl.	Description of items	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
1	*Earth work in excavation foundation*						1.60=102.10-100.50
	Syphon duct	1	8.00	2.70	1.60	34.56	2.70=1.80+2(0.30+0.15)
	U/S Drop pit	1	2.25	2.70	1.60	9.72	
	D/S Drop pit	1	2.25	2.70	1.40	8.51	
	Wing walls	4	1.30	1.00	1.60	8.32	
2	**C.C in foundation**					61.11cum	
	Syphon duct	1	8.00	2.70	0.30	6.48	
	Drop pits	2	2.25	2.70	0.30	3.64	
	Wing walls	4	1.30	1.00	0.30	1.56	
						11.68cum	
3	**First class brick woks in cement mortar (1:4)**						Ht=0.90 considering full bearing of duct slab over the side walls
	Syphon duct walls	2	8.00	0.30	0.90	4.32	
	U/S Drop pit long sides	1×2	2.10	0.30	1.30	1.64	2.10=1.8+0.3
	U/S Drop pit short side	1	1.80	0.30	1.30	0.70	1.30=102.10-100.80
	D/S drop pit long sides	1×2	2.10	0.30	1.10	1.39	
	D/s drop pit short side	1	1.80	0.30	1.10	0.59	
	Wing walls						
	1st footing 70 cm walls	4	1.30	0.70	0.60	2.18	
.	2nd footing 60 cm walls up to top of deck slab	4	1.30	0.60	0.50	1.56	
	Above deck slab	2	5.00	0.60	0.50	3.00	
	3rd footing 50 cm walls	2	5.00	0.50	0.60	3.00	
	4th footing 40 cm walls	2	5.00	0.40	0.40	1.60	
	Parapet 30 cm walls	2	5.00	0.30	0.20	0.60	Ht 20 cm excluding 0.10th coping
4	R.C.C. (1:2:4) deck slab including reinforcement and shuttering	1	8.00	2.40	0.20	20.58cum 3.54cum	2.40=1.80+2×0.30
5.	P.C.C. (1:2:4) copings	2	5.30	0.40	0.10	0.42cu,	5.30=2(1.30+1.5+0.30)+1.80

Sl.	Description of items	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
6	*pointing with cement mortar (1:3)*						
	Syphon duct walls inner sides	2	8.00	–	0.90	14.40	1.30=102.10-100.80
	U/S drop pH (three inner vertical sides)	1×3	1.80	–	1.30	7.02	
	D/S drop pH	1×3	1.80	–	1.10	5.94	5.30=2(1.30+1.5+0.30)+1.80
	U/S and D/S drop pits 3 top surfaces	2	5.70	0.30	–	3.42	
	Parapet walls above G.L Inner faces	2	5.30	–	0.70	7.42	0.70=0.40+0.10 +0.20
	Other faces	2	5.30	–	0.30	3.18	0.30=103.70=103.30-0.10 (coping)
	Edges	2×2	–	0.40	0.40	0.64	
	-do-	2×2	–	0.30	0.20	0.24	
	Outer faces for the portions of Drop pits above deck slab	2	1.80	–	1.40	5.04	
	Triangular portion of outer faces	2×2	½ X 1.10 X	1.10	1.10	2.42	1.10=103.30-102.10
						49.72 Sq.m	
7.	*10 cm thick brick pitching for stream*						
	Bed	2	2.50	1.80	–	9.00	1.27=
	Side slopes	2×2	2.50	1.27	–	121.70	
						21.70 Sq.m	

16

(2)Q. Estimate the quantities of following item for a fall from the drawing in fig. from drawing

    i)   **Earthwork in excavation**   **[10]**

    ii)   **Cement concrete in foundation**   **[5]**

    iii)   **Brick masonry 1st class**   **[5][2019(w)q.no.3]**

Fig. 9-10

17

Sl. No	Particulars of items and details of works	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
1	Earth work in excavation Crest wall sid walls and floor (taken together)-						
	(i)	1	2.65	6.00	1.15	18.29	B=4.5+2×6+2 × .15 = 6.00m
	(ii)	1	2.10	5.80	1.05	12.79	B=4.5+2×5+2×15 = 5.80 m
	(iii)	1	1.50	5.60	0.95	7.98	B=4.5+2×4+2×.15 = 54.60m
	Wing walls beyond side walls	2	1.80	0.70	1.00	2.52	
	Curtain walls	1	4.50	0.60	1.20	3.24	
.	Up stream pitching 20 m depth:- Bed	1	1.80	3.60	0.20	1.30	sloping breadth $= h\sqrt{s^2 +1}$
	Side slopes (up to F.S.L)	2	1.80	1.62	0.20	1.17	$=.9\sqrt{(1\frac{1}{2}^2 +1}$ $=1.62m$
	Down stream channel beyond curtain wall trapezium section $(Bd+sd^2) \times L$	4.0	(5×8 +½	×8²)	×3.90	=16.38	average bredth $=\frac{4.5+3.6}{2}$
	(L=4.20,30=3.90m						$= 4.05m$ $=$ average depth $=\frac{.60+1.00}{2}$ $= .80m$
	Down stream pitching 20 cm depth, excluding toe wall:- Bed	1	3.90x	(4.0+3.2)/2	×0.20 =	2.85	
	Side slopes up to F.S.L. (upper length = 2.0m)	2	4.2+2.0)/2	×1.44	×0.20	1.79	Stopping bredth at middle $= d\sqrt{s^2 +1}$
	Curved portion	2	π×6²	(area)	0.20	0.45	$=8\sqrt{1\frac{1}{2}^2 +1}$ $=1.44m$
	Top wall	2	3.90	0.20	.30 total	0.47	Taken as quadrant of sphrer
						69.23	
	Deduct for set back of wing wall	2	0.60	0.10	1.15	0.14	
				Net		69.09 cum	

Sl. No	Particulars of items and details of works	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
2	Cement concrete 1:3:6 in foundation and floor- Crest wall side walls and floor						
	(i)	1	2.65	6.00	0.45	7.16	
	(ii)	1	2.10	5.80	0.35	4.26	
	(iii)	1	1.50	5.60	0.25	2.10	
	Wing wall beyond side wall	2	1.80	0.70	0.30	0.76	
	Curtain wall	1	4.50	0.60	0.20	0.54	
					Total	14.82	
	Deduct for set back of wing wall	2	0.60	0.10	1.15	0.14	
					Net	Total	14.68 cum	
3	I-lass brickwork in 1 : 4 cement mortar Crest wall						
	1st step	1	4.50	0.70	0.40	1.26	
	2nd step	1	4.50	0.60	1.00	2.70	
	Side wall (i) 1st step	2	2.35	0.60	0.40	1.13	
	2ns step	2	2.35	0.50	0.50	1.18	As per cross sec. BC
	3rd step	2	2.35	0.40	0.50	0.94	
	4th step	2	2.35	0.30	0.70	0.99	
	(ii) 1st step	2	2.10	0.50	0.40	0.84	
	2nd step	2	2.10	0.40	0.50	0.84	As per cross sec. EF
	3rd step	2	2.10	0.30	0.90	1.13	
.	(iii) 1st step	2	1.50	0.40	0.90	1.08	As per cross sec. GH
	2nd step	2	1.50	0.30	0.60	0.54	
	3rd step						
	Wing wall beyond side wall	2	1.80	0.40	0.40	0.58	As per cross sec. XY
		2	1.90	0.40	0.50	0.76	
		2	2.00	0.40	0.50	0.80	
		2	2.10	0.30	0.70	0.88	
	Curtain wall	1	4.50	0.30	0.40	0.54	
	Toe wall	2	3.90	0.20	0.30	0.47	
					total	16.66cum	

CHAPTER:3

SHORT QUS[2 MARK]

(1)Q.   What are the methods of estimating earthwork in road ?2016-1-a

Ans: The following are the methods of estimating earthwork inroad

1.   Mid – sectional area method

   i.e. $Q = (B\,dm + s\,dm^2) \times L$

   where   Q = Quantity of earthwork

               B = Formation width of road

               dm = Mean height of ends

               S = side slope of road

               L = Length of road

2.   Mean sectional area method or Trapezoidal method.

   $Q = L/2\,[\,A_1 + A_n + 2\,(A_3 + A_4 + \ldots\ldots\ldots A_{n-1})]$

   Where A_1 = Area of embankment of road at one end.

               A_n = Area of embankment of road at other end.

3.   Prismoidal method

       $Q = L/6\,[\,A_1 + A_2 + 4\,A_m].$

LONG QUS

(1)Q.   Workout the earthwork for a road from the following data.

   Formation width = 8m

   Slope of earth banking = 2 : 1

   Slope of earth cutting = 1.5 : 1

   The formation has a falling gradient of1 in 250.

   R.L. of formation at chainage0 = 99.5 m.

   R.L. of the ground is as follows [2019-w-Q-1]

Chairage (m)	0	40	80	120	160	200	240
R.L. of Gound	98.7	98.5	98.95	98.8	98.9	98.85	98.9

Ans: B = 8m

For Banking S = 2

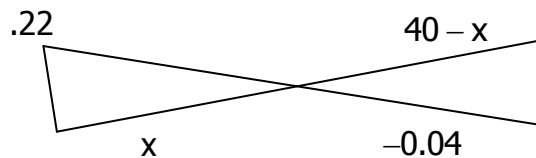For cutting S = 1.5

For a gradient of 1 in 250 chainage of level

Per chainage of 40 m = 1/250 × 40 = 0.16

R.L. of formation of chainage 0 = 99.5 m

Chainage	R.L. of ground	R.L. of Filling	Depth of earthwork
0	98.7	99.5	0.8
40	98.5	99.34	.84
80	98.95	99.18	.23
120	98.80	99.02	.22
160	98.90	98.86	−.04
200	98.85	98.7	−0.15
240	98.90	98.54	−.36

+ve → for banking

−ve → for cutting

$$\frac{40-x}{x} = \frac{0.04}{.22}$$

i) $$\frac{40-x+x}{x} = \frac{0.04+.22}{.22}$$

ii) $$\frac{40}{x} = \frac{.26}{.22}$$

iii) $$x = \frac{40 \times .22}{.26} = 33.814 \; \square \; 34m = 40-x = 6m$$

Chainage	Depth or HF (dm) m	Mean Depth HF dm	Area of central portion (Bdm) m^2	Area of sides (Bdm) m^2	Total aeea Bdm + sdm^2	Length L(m)	Quantity (m^3) cutting	Filling
0	.8							316.192
40	.84	.82	6.56	1.3448	7.9048	40		194.08
80	.23	.535	4.28	0.572	4.852	40		26.04
120	.22	.225	1.8	0.101	1.901	40		30.736
Passes	0	.11	0.88	0.024	.904	34		
160	−.04	−.02	0.16	0.006	.1606	6	.9636	
200	−.15	−.95	0.76	0.014	.774	40	30.96	
240	−.36	−.255	2.04	0.097	2.137	40	85.48	
							117.4 m^3	617.048 m^3

(2)Q. **Detailed dimensioned sketch of a city road C/S is having 10 m. Carriage way (metalled) is given in the fig. Prepare a detailed estimate for constructing 750m. length of this city road.**   2015(s)   (4)

Sl. No	Particulars of items	No	L. m.	B. m.	H. m.	Qty	Explanatory notes
1	Box cutting in road crust, and consolidating and dressing subgrade depth above up to 300 mm.	1	750	10.3		7725 m²	10+.15+.15= 10.3
2.	Base course:- (a) Soling i. Supplying 1st class brick bats in	1	750	10.3	.18	1390.5 m³	.12×50/100=.06 .12+.06=.18
	ii.labour for laying spreading consolidating brick bats	1	750	10.3	.18	1390.5 m³	.18m loose consolidated to .10m (i.e. 50 %)
	(b) Bottom layer:- i. Supplying over burnt brick metal 50 mm size	1	750	10.3	.165	1274.63 m³	
	ii. Labour for spreading & consolidating brick metal.	1	750	10.3	.165	1274.63 m³	Consolidated soil .11+.11/2 =.11+.055 =.165
	(c) Top Layer:- i. Supplying 40 to 25 mm size trap stone metal	1	750	10.3	.1275	984.9 m³	.085+.085/2 =.1275
	ii. Labour for spreading and consolidation 87 stone metal.	1	750	10.3	.1275	984.9 m³	
3.	Wearing coat:- i. Supplying bitumen delivered stack at side	1	750	940	@280 kg	Per 100 m²	10–2×.3 =9.40
	ii. Supplying trap stone chips 12 to 6.3 mm size.	1	750	940	@3.83 M³	19740 kg	
	iii. Premixing, aying premix chips applying tack coat and consolidating 35 mm thick carpet	1	750	940		Per 100 m² 238.29 m³	
4.	Edging:- i. Supplying 900 × 300 × 100 mm stone bock for kerb & channel	2 × 2	750			750 m²	
	ii. Channel on 75 mm thick cement concrete	2 ×	750			3000 rm	

(3)Q. **Estimate the quantities of the items involved per construction of WBM road from the following data :-**

→ **Length of the road = 20,000 mm**

→ **Metalled with = 3.700 mm**

→ **Thickness of Gr-1 metal soling = 80 mm**

→ **Wearing coat of G-II meal 120 mm loose (Consolidated to 80 mm thick surface of the road is to be finished with two coats of CRMB Bitumen as given below**

→ **1st finishing coat : 12 mm chips @ 0.018 m^3 and bitumen @ 1.22 kg per sqm. Of road surface.**

→ **2nd finishing coat : 6 mm hips @ 0.01 m^3 and bitumen @ 1.22 kg per sqm. Of the road surface.**

→ **consumption of fuel @ 0.4 kg 1 kg of bitumen.[2016-q-4,2019-w-q-2]**

Ans: Length of road = 20000 mm = 20 m

Metalled width = 3700 mm = 3.7 m

Area of road surface = 20 × 3.7 = 74 m^2

Thickness of G-I metal soling = 80 mm = 0.08 m

Volume of metal soling of G-I = 74 × 0.08 = 5.92 cum

Wearing coat of G-II metal 120 mm loose consolidated to 80 mm

Thickness of G-II metal soling = 120 mm = 0.12 m

Volume of G-II metal wearing coat = 74 × 0.12 = 8.88 cum

1st coat finishing

12 mm chips @ 0.018 m^3 for 1 sqm. Of road surface

Volume of chips (12 mm) = 74 × 0.018 = 1.33 cum

Bitumen @ 1.22 kg for 1 sqm of road surface

Volume of Bitumen = 74 × 1.212 = 90.28 kg.

2nd Coat finishing

6 mm chips @ 0.01 m^3/sqm of road surface

Volume of chips = 74 × 0.01 = 0.74 cum

Bitumen @ 1.22 kg sqm of road surface

Volume of Bitumen = 74 × 1.22 = 90.28 kg

Total volume of Bitumen = 90.28 + 90.28 = 180.56 kg.

Fuel consumption @ 0.4 kg / kg of Bitumen

Total fuel consumed = 0.4 × 180.56

$\qquad\qquad$ = 81.252 kg.

CHAPTER: 4

SHORT QUS

(1)Q.   What is muster roll ?[2018 (s) (1-i),2019-w-q-6-a]

Ans: The wages of other day labours are drawn on muster rolls and charged to the works estimate on which they are employed. Muster roll form provides columns for recording attendance for a month but the roll may be closed for payment earlier or on completion of the job. Payment is made by official highest standing available at spot obtained on the roll.

(2)Q.   What is imprest amount ? [2018(s) (1-ix)]

Ans: An imprest is a standing advance of a fixed sum of money given to subdivisional officer and sub assistant engg. To enable them to make day to day duty payments for proper discharge of their duties.

(3)Q.   What is temporary advance ?   [2017 (s)(1-X)]

Ans: Temporary advance are granted to S.D.O. of S.A.E. for making specific payment on bills or muster roll etc. already passed for payment by divisional office.

(4)Q.   What Earnest money? [2016(s) 1(iii)]

Ans: Earnest money assurance or guarantee in the form of cash on the part of contractor to keep open the offer for consideration and to confirm his intentions to take up the work accepted in his favour for execution as per terms and conditions in the tender.

(5)Q.   What is subsidiary cash book ?   [2017(s) 1(vii)]

Ans: The divisional officer has to maintain another cash account known as subsidiary cash book to record transactions of receipts and payments relating to pay, allowances etc. of his regular establishment for whom he draws money from treasury by presentation of bill.

Medium qus(5 mark)

(1)Q.   Administrative approval and technical sanction.[2016 q.no1(i)]

Ans: A formal approval is given by an administrative department of the govt for a work are project for which preliminary estimate has been framed by P.W.D. to meet the needs of department requiring the work. This is a order by the govt the execute the proposed work with in the amount sanction.

Technical Sanction: After recept of administrative approval and expenditure sanctioned detailed estimate is further sanction by a compedend technical authority of the Engg. Department employed by the Govt., which ensures that the proposals are structurally sound and the estimate is accurately calculate based on adequate data such saction is known as technical saction and should be taken before inviting tenders to execute the work.

(2)Q.   Mustor Roll and Acquitance Roll   [2019, w-q-6(b).]

Ans: Muster Roll : The categories of skilled and unskilled workers employed on works are daily rated wages are drawn in muster roll whose daily attendance and out turn are recorded for purpose of payment. They are directly under the J.E. depending upon importance may be supervised by the Asst. Engineer or executive engineer.

Acquitance Roll: Acquitance roll is payment of salary to pertions of regular establishment paied in regular pay bill. But the payment is made on sepuret receipt form known as acquitance roll in which the persion should sign on duely revinue stamp against his name. This is the avidance of payment to the persion.

(3)Q.   Security Deposit and Earnest Money.2016-q-7-iii

Ans: Earnest money is an assurance or gurantee in the form of cash on the part of the contracter to keep open the offer for consideration and to onform his intention to take up the work accepted in his favour for execution as performs and conditions in the tender. The amount of earest money not large it may be deposited in cash in division or sub-division office. The earnest money given by the contractors except the three lowest tender should be returned with in a week will or 15 days of the except once of the tender if their offers not considerate. The earnest money of the lowest tenderer whose tender is

normaly excepted is kept by the department is security deposits for the due performance of the construct.

Security Deposite: This deposite is an amount of money which shall be deposited by the contractor whose tender has been accepted in order to render himself laible to the department to pay compensation amounting being if the work is not satisfactory along according to the specification. This deposite may be refundable after the work has been completed after certain time. Whose maintenance period is over.

4)Q. Running bill and Final bill   [2017(s)   5(iv)]

Ans: **Runing Bill :** The contractors may be paid according to the work done by them in bills i.e., partly payments the bill may be 3 types.

Inter mediate or running payment as running account is shortly known as R.A −1, R.A −2, R.A–3 etc. This bill is prepared when a construction work is in progress and intermediate and running payment is made to the contractor in order to give him some financial relief at different stages of progress after giving some running account payments when the contractor completes the work the last payment is known as final payment.

Final Bill : After giving some running payments then the contractor complete the work the last payment known as final payment made in the final bill before final payment the authority should check up the works has been kone satisfactory no damage and to defects should be there.

5)Q. Debit and Credit   [2017. 7(iv)]

Ans Debit: The debit comprises of loan raised by govt and the remittances division consists of all merely adjusting heads. i.e., remittances of each between treasuries and transfer transactions between different accounting circles.

Credit: Credit is a note on the basis of which the book adjustment is made between railway and public works department through the accountant general concerned. Some times private commercial firms purchase the credit notes from the railway authorities to pay through credit notes. The divisional officers are usually authorized to sign credit notes.

6)Q. Tools and Plants, Muster Roll.2017-7-i

Ans: The categories of skilled and unskilled workers employed on works are daily rated wags are drawn in master roll whose daily attendance and out turn are recorded for purpose of payment. They are directly under the J.E. depending upon importance may be supervised by the Assistant Engineer or executive Engineer.

Tools and plants:

The tools and plants of a division are of two categories.

Ordinary T and P i.e. those required for the general use of the division and the cost of which is charged to minor head tools and plant.

Special T and P i.e. those required for a specific work , the cost of which is borned by the work concerned.

7)Q. Annual repair, Special repair.   [2016 (1-v)]

Ans: Special repair : On the occasion of damages caused by flood, cyclone and other natural calamities repairs will be estimated and the cost of repair will be sanctioned by the com competent authority for that work. Those are called special repairs.

Quadrential repair:- The repair works taken up at every three months wil be called as quadrential repair, which is required for cleaning of sewer line , over hawling of the hings of the door and gates and windows etc, cleaning of surrounding are etc are very much necessary of maintenance of the structure

8)Q. Measurement Book, Standard Measurement Boom.   [2016 (1-iii)]

Ans: A set of measurement book containing detailed measurement of specific buildings and structures maintained by each subdivision is kept to facilitates framing of annual repairs estimates and for payment to constructs for job connected there with. There M.B's are known as standard measurement books. The S.M. Bs save time and labour of the department officers from repeated work of taking detailed measurements of the same building again and again.

9)Q. Item rate contract   [2016, 1(iv)]

Ans: It is also known as unit price contract or schedule contract.

→ For item rate contract contractors are required to quote rates for individual items of work on the basis of schedule of quantities.

→ The schedule indicates full nomenclature of the items as per sanctioned estimate, estimate quantities and unit there in.

→ While filling up rates, the contractors are required to express the amount in figures and words and also work out the cost against each item.

10)Q.   Tender Notice   [2016 (1-vi)]

Ans: The notice inviting tender paper is a very important document on which tender and subsequent agreements with contractor are based.

→ Tender notice should stipulate reasonable time for completion of work.

→ All tender notices should be in the standard form of department.

→ It is displayed in notice board of the division and also circulated to the releated sub division and other division of department.

11)Q.   What is subsidiary Cash Book and Arbitration ?   [2017(1-viii)]

Ans: Divisional officer has to maintain another cash account known as subsidiary cash Book to record transactions of receipts and payments relating to pay and allowances etc. of his regular establishment for whom he draws money from treasury by presentation of bill.

Arbitration :-

All the questions, disputes, meaning, claim arising out of or relating to the contract, estimates specifications, designs, drawing quality of workmanship or material, used on the work, instructions, order or those conditions or otherwise concerning the works or execution or failure to execute the same arising at any stage shall be referred to sole arbitration of chief engineer of department.

12)Q. What is imprest amount and Temporary Advance ?[2018(s) (1-ix)]

Ans: An imprest is a standing advance of a timed sum of money given to assistant engineer to enable them to make day to day petty payments for proper discharge of their duties. In the end of the month an account for that expenditure will be made and will be sent to executive engineer for his knowledge and balance amount after expenditure will be noted.

Temporary advance:-

This advance is granted to SDO of JE for making specific payments on bill or muster Roll already passed for payment by executive engineer, the account is maintained of expenditure and submit to executive engineer to be erered in cash book maintained there.

13)Q. What is Contigency budget ?2017-7-ii

Ans: Budget is annual financial statement showing the contigncy estimated receipts and expenditure in respect of a financial year, before the commencement of that year. To enable the government to judge the relative urgency of demands and made against the amounts likely to be available for expenditure on different works head of accounts, during the ensuing year, statements of accepted estimates known as budget estates for next year are prepared and submitted to ministry concerned.

14)Q. Suspense Account and Subhead Account.2018-q-7-iii

Ans: Suspense Account:-

These accounts are meant for the temporary transitions and must at once be taken into the account of the works of grant concerned but can not be cleared finally because the relevant payment, recovery or adjustment is awaited.

Subhead Account:-

Proper head of accounts means all the revenues and expenditures have to be accounted for under main head of account and sub head of account.

15)Q. Work charge establishment, Regular establishment[2018(w)(1-ii)]

Ans: Work charged establishment includes such establishment as is employed upon actual execution excluding the general supervision of a particular work or stores and machinery in connection with such work. Work charged staff may be sub Assistant Engineer, a person employed as an under staff of the sub assistant engineer to assist him at work site

Regular Establishment:-

It includes (i) Permanente establishment

       (ii) Temporary establishment

Employees appointed against permanent posts are paid regularly is called permanent establishment. When new project are sanctioned by Government ,

this work   include temporary post with consideration that extra workload is called temporary establishment.

16)Q. Bill and Voucher   [2016(w) (1-v)]

Ans: Bill is detailed account of claim for works done or supplies made indicating quantities, rates and amount due. The bill after payment becomes voucher and is kept on record as a legal proof of payment.

a) First & Final bill

b) Running account bill

c) Hand Receipt

Q. **Explain the step by step procedure with the related documents for awarding a construction of N.H. (National High way) Road to a contractor by N.H. (Govt.) Authority. 2016(s)   (6-b)**

Ans: The different stages in order step by step are as follows:

→   Preliminary investigation will be made and preliminary estimate will be prepared together with sketch plan.

→   Administrative approval of the department concerned wil then be obtained.

→   Land acquistim proceedings will be started.

→   Detailed survey will be made as required depending on the nature of the project and survey plans will be prepared.

→   Design, drawing, plans, elevations, sections etc will then be prepared.

→   Detailed estimate of all works complete with abstract, general abstract report, return design calculation, detailed specification etc wil then be prepared and technical sanction of competent authority will be obtained. The cost of land will be included in the estimate.

→   Allotment of fund or expenditure sanction will then be obtained.

→   Requirement of material will be worked out and statement of important materials prepared collection of important materials as cement steel and coal will be started.

→   Arrangement for tools and plants as required will be started.

$\rightarrow$ Tenders for the work will be invited giving wide publicity on receipt of tenders comparative statement of the tenders will be prepared and the tender will be got accepted by competent authority.

$\rightarrow$ Contract agreement or contract bond will be prepared with all contract documents, schedules, specifications, drawing, etc.