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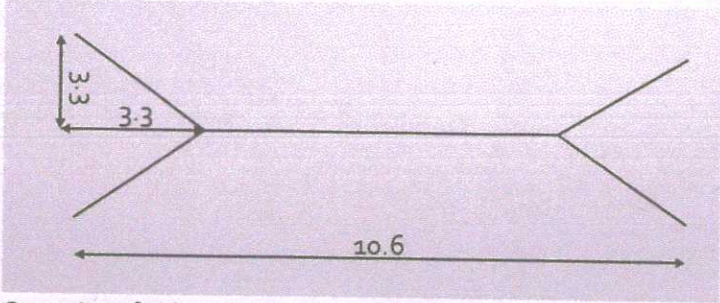
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Scheme of Evaluation
Scoring Indicators

Revision: 2015

Course Code : 5014

Course Title : Quantity Surveying II

Q No	Scoring Indicator	Split up score	Sub Total	Total
PART A				
I 1	<p>Length of common rafter = $\sqrt{\left(\frac{Span}{2}\right)^2 + \left(\frac{Span}{4}\right)^2}$</p> <p>= $\sqrt{\frac{Span^2}{4} + \frac{Span^2}{16}}$</p> <p>= 0.559 x span</p>	1 1		2
2	<p>A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other. A culvert is a small bridge structure of less than 6m span between faces of abutment.</p> <p>Bridge is a structure carrying a road, path, railway, etc. across a river, road, or other obstacle.</p>	1 1		2
3	<p>Bar bending schedule or schedule of bars (BBS) is a list of reinforcement bars for a given reinforced concrete work item, and is presented in a tabular form for easy visual reference.</p> <p>Table of bar bending schedule summarizes all the needed particulars of bars – diameter, shape of bending, length of each bent and straight portions, angles of bending, total length of each bar, and number of each type of bar.</p>			2
4	<p>Annuity is the net instalment of annual or periodical payment for repayment of the capital amount invested in a property for a specified period. Annuity is either paid at the beginning or at the end of each period of instalment.</p>			2
5	<p>Estimated value of a built-up property at the end of its useful life without being dismantled. Generally accounted by deducting the depreciation from its cost.</p> <p>Depreciation: Loss in the value of the property due to its use, life, wear, tear, decay, etc.</p>			2
PART B				
II 1.	<p>Eave to eave length = $9 + 2 \times 0.2 + 2 \times 0.6 = 10.6\text{m}$</p> <p>Eave to eave span = $5 + 2 \times 0.2 + 2 \times 0.6 = 6.6\text{m}$</p> <p>Span/2 = $6.6/2 = 3.3\text{ m}$.</p> <p>Considering isosceles right angled triangle, from figure length of ridge piece = $10.6 - 2 \times 3.3 = 4\text{ m}$</p>  <p>Quantity of ridge piece = $4 \times 0.12 \times 0.15 = 0.072\text{ m}^3$</p>	1 1 2 2		6
2	<p>Total Centre line length = $10.5 + 2 \times 4.4 + 2 \times 6.7 + 3.2 + 7 + 3.8 + 2 + 2.6 + 3.8 = 55.1\text{ m}$</p>	3 3		6

Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks
1	Cement concrete in foundation	1	51.1	0.8	0.15	6.612	m ³	$L = 55.1 - 10 \times \frac{0.8}{2} = 51.1$

Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks
1	Earth work excavation in foundation							
	Abutment	2	5.3	0.8	0.75	6.36	m ³	
	Wing walls	4	1.4	0.8	0.75	3.36	m ³	L=5+0.3
						9.72	m ³	

Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks
1	Footing (Bottom Portion)	1	1	1	0.15	0.150	m ³	
2	Footing (Upper Portion) Trapezoidal							
			$\frac{h}{6}(A1 + A2 + 4Am)$			0.113	m ³	
			h=0.25					
			A1 = 1 x 1					
			A2 = 0.28 x 0.28					
			$Am = \left(\frac{1+0.28}{2}\right)\left(\frac{1+0.28}{2}\right)$					
3	Column (Bottom Portion)	1	0.28	0.28	0.45	0.035	m ³	
4	Column(Upper Portion)	1	0.20	0.20	4	0.16	m ³	
						0.458	m ³	

- 5
- Before the earth work is started, the whole area where the work is to be done shall be cleared of grass, roots of trees and other organic matter.
 - The excavation shall be carried out exactly in accordance with the dimensions shown on the drawings or such other dimensions as the Engineer – in – charge may decide.
 - Sides of the trenches shall be vertical and its bottom shall be perfectly leveled, both longitudinally and transversely. Where the soil is soft, loose or slushy the trench shall be widened for allowing steps on either side or the sides sloped or shored up.
 - During excavation if rocks or rocky soils are found those shall be leveled as far as possible and the small spaces which are difficult to level shall be filled in with concrete.
 - If the excavation is in earth, the bottom of the trenches shall be sprinkled with a little water and rammed. Any excess digging or any patches of bad soil or hollows shall be removed by placing concrete or shall be subject to any other special treatment as the Engineer – in – charge decides.
 - No material excavated from foundation trenches, shall be placed nearer than one metre to the outer edges of the excavation.
 - Water in trenches must be bailed or pumped out and where it is apprehended that the sides may fall down arrangement shall be made for adequate timber shoring.
 - When it is specified that the work is to be carried out without removing pipes, cables, sewers, etc.all of them shall be temporarily shored and

	<p>saved from any damage</p> <ul style="list-style-type: none"> The materials or valuables found during excavation shall be the property of the Government. The cost of all materials and labour required for fencing in and protection against risk of accidents due to open excavation shall be provided. <p>Any 6 prominent points</p>			
6	<p>Depreciation is the loss in the value of property due to its use, life, wear, tear, decay, etc. Value of a building or property (but not land) decreases gradually up to the utility period due to depreciation.</p> <p>Methods of determination of depreciation:</p> <ul style="list-style-type: none"> Straight line Method Constant Percentage Method Sinking Fund Method Quantity Survey Method <p>Straight line method</p> <ul style="list-style-type: none"> Property is assumed to lose value by a constant amount every year, a fixed amount of original cost is written off every year, so that at the end of the term when the asset is worn out, only Scrap/ Salvage Value remains. Annual Depreciation, $D = \frac{C - S_c}{n}$ C – Original Cost S_c – Scrap / Salvage Value n – Life of property in years <p>Constant percentage method/declining balance method</p> <ul style="list-style-type: none"> Property is assumed to lose value annually at a constant percentage of its value $P = 1 - (S_c/C)^{1/n}$ Value of the property at n years = $C(1 - P)^n$ P - Percentage rate of annual depreciation for the constant % method expressed in decimal C – Original Cost S_c – Scrap / Salvage Value The formula doesn't hold good when Scrap / Salvage Value = zero <p>Sinking Fund Method</p> <ul style="list-style-type: none"> In this method the depreciation is assumed to be annual sinking fund plus the interest of the accumulated Sinking Fund till that year Total Depreciation percentage % in that year (m^{th} year) = $\frac{i}{(1+i)^n - 1} \times \frac{(1+i)^m - 1}{i}$ n - Life <p>Quantity Survey Method</p> <ul style="list-style-type: none"> Property is studied in detail and the extend of physical deterioration worked out to calculate depreciation Property is studied in detail and loss in value is worked out. Each and every step is based on some logical ground, without any fixed percentage of the cost of the property 	2		6
7	<p>Sinking Fund:</p> <p>Sinking Fund is an amount which has to be set aside at fixed intervals of time (Say annually) out of the gross income so that at the end of the useful life of the building or property, the fund should accumulate to the initial cost of property.</p> $I = I_c \times S$ $I_c = \frac{i}{(1+i)^n - 1}$ <p>S – Total amount of Sinking Fund i – Rate of interest expressed in decimal n – No. of years I_c – Coefficient of annual Sinking Fund I – Annual instalment required</p>	3		6

Scrap value = 10% of building cost
 Total amount of Sinking Fund S = 90% of cost of building
 $C - 0.1 C = 0.9 C$

Years Purchase:

YP is defined as the capital sum required to be invested in order to receive a net annual income as an annuity of Rs.1/- at a certain rate of interest.

For annual income of Rs.1/-,

$$YP = \frac{1}{I_p}$$

$YP = \frac{1}{I_p + I_c}$, YP becomes reduced if Sinking Fund is there

I_p – Rate of interest on capital (Decimal)

I_c – Sinking Fund coefficient

3

PART C

III

Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks
1	Earthwork in excavation Septic tank	1	2.8	1.7	1.95	9.28	m ³	L = 2+2x0.3+2x0.1 B = 0.9+2x0.3+2x0.1 H = 1.4+0.3+0.2+0.05
	Soak pit up to 3 m depth	1	$\frac{\pi \times 2^2}{4}$	X	3	9.42	m ³	1+2x0.2+2x0.15+2x.15 = 2
	Soak pit lower portion	1	$\frac{\pi \times 1.4^2}{4}$	X	0.2	0.3	m ³	L = 1+2x0.2
2	Cement concrete 1:3:6 Foundation	1	2.8	1.7	0.2	0.95	m ³	
	Sloping floor	1	2	0.9	0.05	0.09	m ³	H = $\frac{(0+0.1)}{2}$
						1.04	m ³	
3	1 st class brick work in 1:4 cement mortar in septic tank							
	1 st step							
	Long walls	2	2.6	0.3	0.6	0.94	m ³	L = 2+2x0.3
	Short walls	2	0.9	0.3	0.6	0.32	m ³	
	2 nd step							
	Long walls	2	2.4	0.2	1.15	1.10	m ³	L = 2 + 2x0.2
Short walls	2	0.9	0.2	1.15	0.42	m ³	H = 1.7 + 0.05 - 0.6	
					2.78	m ³		
4	2 nd class dry brickwork in soak pit	1	$\pi \times 1.2$	0.2	2.5	1.88	m ³	

1

1.5

1.5

1.5

1.5

3

3





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Volume of cylinder = Base area x Ht $\pi r^2 \times h = \frac{\pi \times D^2}{4} \times h$

Average ht of sloping floor = $\frac{(0+0.1)}{2}$

15

IV a	Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks			8	
	1	RCC Work											
		Up to hall	1	11.5	5.4	0.12	7.452	m ³		2			
		Beyond hall	1	7.7	2.6	0.12	2.402	m ³	B = 8 - 5.4 = 2.6	2			
		Lintel	1	54.1	0.2	0.15	1.623	m ³	L = 55.1 - 10 x $\frac{0.2}{2}$ =	2			
							11.477	m ³	54.1				
	Total c/c length = 10.5 + 2x4.4 + 2x6.7 + 3.2 + 7 + 3.8 + 2 + 2.6 + 3.8 = 55.1 m										2		
IV b	<p>Span (eave to eave) = 6m + 2x0.3 m + 2 x 0.6 m = 7.8 m</p> <p>Length of common rafter = $\sqrt{\left(\frac{\text{Span}}{2}\right)^2 + \left(\frac{\text{Span}}{3}\right)^2} = 4.687\text{m}$</p> <p>No. of common rafters required can be found out by dividing length of ridge piece by spacing of common rafters.</p> <p>Length of ridge piece = 10 m + 2x0.3 m + 2x0.6 m = 11.8 m</p> <p>No. of common rafters on one side = $\frac{\text{Len of ridge piece}}{\text{Spacing of common rafter}} + 1 = \frac{11.8}{0.5} + 1 = 25$</p> <p>No. of common rafters on both sides = 2 x 25</p> <p>Wood work for common rafters = 50 x 4.687 x 0.05 x 0.125 = 1.465 m³</p>												
V	Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks			15	
	1	Cement concrete 1:3:6 in foundation with stone ballast											
		Abutments	2	5.3	0.8	0.3	2.54	m ³	L=5+0.3	2			
		Wing Walls	4	1.4	0.8	0.3	1.34	m ³		2			
							3.88	m ³					
	2	1 st class brick work in 1:4 CM											
		Abutments	2	5	0.5	1.57	7.85	m ³	Height – taken up to top of roof slab	1.5 x 6 = 9			
		Wing walls	4	1.4	0.5	1.57	4.4	m ³	H =				
		Parapet 50 cm layer	2	5.3	0.5	0.3	1.59	m ³	0.9+0.45+0.22 = 1.57				
		Parapet 40 cm layer	2	5.3	0.4	0.4	1.7	m ³					
								m ³					
		Deduct Bearing of RCC slab in abutment	2	5	0.3	0.22	0.66(-ve)	m ³					
							14.88	m ³		2			
	3	RCC work 1:2:4 in slab excluding steel and it's bending but including centering shuttering and binding of steel	1	5	2.1	0.22	2.31	m ³	B = 1.5 + 2x0.3				

VI									15
Sl No	Description of item	No	L	B	H	Quantity	Unit	Remarks	
1	Earthwork in excavation								
	a) Pier straight portion	1	9.91	1.6	1.6	25.37	cum	$L = 9.8 + 0.11$ One side of octagon = $2 \times 0.8 \times \tan(45/2) = 0.66$	
	b) Ease Water end (forming $3 \times 2 \times \frac{1}{2} = 4$ triangles of an octagon, central angle of triangle is 45°)	4	$\frac{1}{2} \times 0.66$	0.8	1.6	1.69	cum		
	c) Cut water end (forming equilateral triangle with 60°)	1	$\frac{1}{2} \times 1.6$	1.39	1.6	1.78	cum		
						28.84	cum		
3x5									
2	Cement Concrete 1:3:6 in foundation								
	a) Pier straight portion	1	9.91	1.6	0.6	9.51	Cum		
	b) Ease water end	4	$\frac{1}{2} \times 0.66$	0.8	0.6	0.67	Cum		
	c) Cut water end	1	$\frac{1}{2} \times 1.6$	1.39	0.6	0.67	Cum		
						10.81	Cum		
3	Plastering to Masonry Work (Exposed faces)								
	Pier Sides	2	9.84		2.8	55.1	m ²		
	Ease water end	1	$\frac{\pi}{2} \times \frac{0.8 + 1.1}{2}$		2.8	4.18	m ²		
	Cut water end	2	$\frac{0.8 + 1.1}{2}$		2.8	5.32	m ²		
VII									15
Sl no	Description of bar	Shape	Length of each bar	Unit	No. of bars	Total length (m)	Total weight (kg)		
1	12 mm Dia bars 15 cm c/c both ways		$1 - 2 \times 0.05 + 12 \times 0.012 = 1.044$	m	$2 \times \left(\frac{1 - 2 \times 0.05}{0.15} + 1 \right) = 14$	14.616	13.008	4	
2	12 mm Dia bars (Column)		$0.4 + 3.4 + 0.6 + 0.45 + 0.02 = 4.87$	m	4	19.48	17.337	3	
3	12 mm Dia splice bars		$0.15 + 0.45 + 0.25 + 0.15 + 0.4 = 1.4$ $1.4 - 0.05 - 2 \times 0.012 = 1.326$	m	4	5.304	4.72	3	
4	8 mm Dia binders @ 18 cm c/c		$2(B' + D') + 24d = 0.76$ $D' = 0.2 - 2 \times 0.025 - 0.008 = 0.142$ $B' = 0.2 - 2 \times 0.025 - 0.008 = 0.142$ $d = 0.008$	m	$\frac{0.25 + 0.45 + 0.6 + 3.4}{0.18} + 1 = 27$	20.52	8	5	
VIII									9
a	MATERIALS Coarse aggregate: Aggregates shall comply with the requirements of IS 383. It shall be crushed or broken from hard stone from the approved quarry. <ul style="list-style-type: none"> It shall be hard, strong, dense and durable, clean and free from soft friable, thin, flat, elongated or laminated, flaky pieces and shall be roughly cubical in shape. 							2	

	<ul style="list-style-type: none"> • It shall be clean and free from dirt and any other foreign matter. • Coarse aggregate may be graveled, may either be river bed shingle or pit graveled. It shall be sound, hard, clean suitably graded in size. • This shall be free from flat particles of shale, powdered clay, slate, loam and other impurities. • Gravel shall have to be washed if it contains soil materials adhering to it. • Unless specially mentioned the size of the coarse aggregate shall be 20 mm graded down and shall be retained in 5mm square mesh so that the voids do not exceed 42%. <p>Fine aggregate:</p> <ul style="list-style-type: none"> • Aggregate most of which passes 4.75mm IS sieve is known as fine aggregate. Sand as fine aggregate shall be coarse, consisting of sharp, angular grains and be of standard specification. • Crushed dust stone may also be used as fine aggregate. <p>Cement:</p> <ul style="list-style-type: none"> • Cements shall be phrased as Portland cement and confirmed to the IS specification. • It should have required compressive and tensile strength and fineness. <p>Water:</p> <ul style="list-style-type: none"> • Water used shall be clean and reasonably free from injurious quantities of deleterious materials such as oils, acids, alkalis, salts and vegetable growth. • Generally potable water shall be used. • The pH value of the water should not be less than 6. • The maximum permissible limits for solids shall be as per IS 456:2000 Clause 5.4 <p>PROPORTION</p> <ul style="list-style-type: none"> • Proportioning of cement, sand and coarse aggregate shall be 1:2:4 or as specified. • Coarse aggregate and sand shall be measured by measuring box of 30cmx30cmx38cm of suitable size equivalent to one bag cement of 1/30 m³ or 0.035 m³. • Cement shall be measured by bag weighing 50kg. • Sand shall be measured on the basis of its dry volume. • While measuring the aggregate sacking, ramming or hammering shall not be done. • If damp sand is used compensation shall be made by adding additional sand to the extent required for the bulking of damp sand. <p>MIXING</p> <p>Hand mixing:</p> <ul style="list-style-type: none"> • Hand mixing by batches shall be permitted on small works. • The mixing shall be done on a clean water tight masonry or concrete slab or steel plate platform. • Measured quantity of sand shall be sprayed evenly. The cement shall be dumped on the sand and distributed evenly. The sand and cement shall be mixed thoroughly with spade turning the mixture over and over again until its even colour throughout and free from streaks. The measured quantity of coarse aggregate shall be sprayed out and the sand cement mixture shall be sprayed on its top. • This shall be mixed at least three times by shoveling and turning over by twist from centre to side then back to the centre and again to the sides. • A hole shall be made in the middle of the mixed pile. • Three quarters of the total quantity of water required shall be added while the material is turned in toward the centre with spades. • The remaining water shall be added and slowly turn the whole mixtures over and over until a uniform colour and consistency is obtained throughout the pile. <p>Machine Mixing:</p> <ul style="list-style-type: none"> • Measured quantity of dry coarse aggregate, fine aggregate and cement shall be placed in the hopper respectively. • The dry materials shall be mixed in the mixing drum for at least four turns 	2		
	<p>MIXING</p> <p>Hand mixing:</p> <ul style="list-style-type: none"> • Hand mixing by batches shall be permitted on small works. • The mixing shall be done on a clean water tight masonry or concrete slab or steel plate platform. • Measured quantity of sand shall be sprayed evenly. The cement shall be dumped on the sand and distributed evenly. The sand and cement shall be mixed thoroughly with spade turning the mixture over and over again until its even colour throughout and free from streaks. The measured quantity of coarse aggregate shall be sprayed out and the sand cement mixture shall be sprayed on its top. • This shall be mixed at least three times by shoveling and turning over by twist from centre to side then back to the centre and again to the sides. • A hole shall be made in the middle of the mixed pile. • Three quarters of the total quantity of water required shall be added while the material is turned in toward the centre with spades. • The remaining water shall be added and slowly turn the whole mixtures over and over until a uniform colour and consistency is obtained throughout the pile. <p>Machine Mixing:</p> <ul style="list-style-type: none"> • Measured quantity of dry coarse aggregate, fine aggregate and cement shall be placed in the hopper respectively. • The dry materials shall be mixed in the mixing drum for at least four turns 	2		

	<p>of the drum after which correct quantity of water shall be added gradually while the drum is in motion.</p> <ul style="list-style-type: none"> The total quantity of water for the mixing shall be introduced before 25% of the mixing time has elapsed and shall be regulated to achieve the specific water cement ratio. The mixing shall be thorough to have a plastic mix of uniform colour. <p>LAYING</p> <ul style="list-style-type: none"> The entire concrete used in the work shall be laid gently in layers not exceeding 15cm and shall be thoroughly vibrated by means of mechanical vibrators till a dense concrete is obtained. Hand compaction shall be done with the help of punning rods and tamping rods and tamping with the wooden tampers so that concrete is thoroughly compacted and completely walked into the corners of the form work. The layers of concrete shall be so placed that the bottom layer does not finally sit before the top layer is placed. Compaction shall be completed before the initial setting starts that is within thirty minutes of addition of water to the dry mixture. <p>PROTECTION AND CURING</p> <ul style="list-style-type: none"> Freshly laid concrete shall be protected from rain by suitable covering After the concrete as begun to harden, that is about one to two hours after its laying it shall be protected with moist gunny bags, sand or any other materials against quick drying. After 24hrs of lying of concrete the surface shall be cured by flooding with water of about 25mm depth or by covering with wet absorbent materials .Curing shall be done for a minimum period of 14 days. 	2		
VIII b	<p>DPC of cement concrete should have a mix of 1:2:4 or 1:1.5:3 mixed - usual thickness 2.5cm to 4 cm</p> <p>Materials</p> <ul style="list-style-type: none"> Coarse aggregate shall be of clean, hard and dense stone chips 12 mm down and shall be washed before use. Sand shall be clean, sharp and coarse of average 5mm size and shall be free from dust, and dirt screened before use. Cement shall be fresh Portland cement. All the materials in use including water – proofing compound shall be of their respective standard specifications. <p>Mixing</p> <ul style="list-style-type: none"> Some sample tests of cement bags shall be made at work site to ensure the specified weight and volume. The mixing shall be done on a clean solid platform. Dry coarse aggregate shall be stacked evenly on the platform. Sand and cement in the specified quantities at first shall be mixed dry till uniform colour and spread over the stacked coarse aggregate. The materials shall then be turned over once without adding water and then at least further 3 times, adding the required quantity of water gradually and slowly to give a uniform concrete. Water- proofing compound Pudlo or Cico @ 5 or 3 per cent by the weight of cement as specified shall be mixed with concrete to make it water proof. <p>Preparation of base</p> <ul style="list-style-type: none"> The top of wall (if wall top is not properly protected from rain) on which damp proof course is to be laid shall be constructed with bricks on edge or with frogs of the bricks down. The top of the plinth bed (to prevent rise of water by capillary action)over which damp proof course is to be placed shall be thoroughly cleaned with a steel brush, washed and wetted before laying the course of concrete. Wooden straight edges shall be fixed on plinth wall having the same inner width as that of required width of the DPC. <p>Laying</p> <ul style="list-style-type: none"> Damp – proof course may be laid to the full width of the plinth or of the superstructure as specified in the drawing or specially mentioned. It shall be laid to the specified thickness (2.5 cm or 4 cm) over the plinth wall 	1 2 1 1		6

	<p>= 44,280 Rs</p> <ul style="list-style-type: none"> ▪ The total cost of land assuming Rs. 60 per m² = 60 x 500 = Rs. 30,000 ▪ Total valuation of property = 44280 + 30000 = Rs. 74280 <p><i>Finding Cost of building – 2Marks. Writing formula – 1Mark. Substituting and finding D – 3 Marks. Finding cost of land – 2 Mark. Total Value – 1 Mark</i></p>			
X	Annual depreciation = $\frac{\text{Original cost} - \text{Salvage Value}}{\text{Life in years}} = \frac{2000000 - 200000}{50} = 36000 \text{ Rs}$	2		6
b	<ul style="list-style-type: none"> • Depreciation for 20 years = 36000 x 20 = Rs. 7,20,000 • Depreciated cost of building after 20 years = 2000000 – 720000 = Rs. 1280000 	2		
		2		