
SUMMER – 2015 EXAMINATION

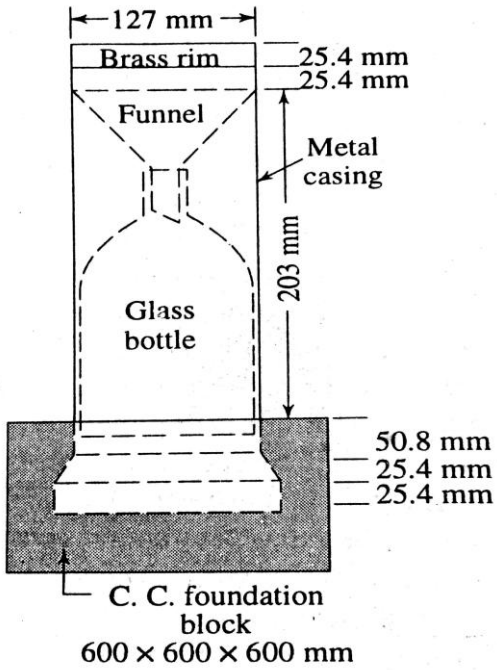
MODEL ANSWER

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and the model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Model Answer

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	**A) a) Ans.**	**State any four advantages and four ill effects of irrigation.** **Advantages of irrigation:** 1. Yield of crops 2. Protection from famine 3. Improvement of cash crops 4. Prosperity of farmers 5. Source of revenue 6. Navigation 7. Hydroelectric power generation 8. Water supply 9. General communication 10. Development of fishery. **Ill effects of irrigation:** 1. Rising of water table 2. Formation of marshy land 3. Dampness in weather 4. Loss of valuable land	***½ marks each (any four)*** ***½ marks each***	**4**
	b) Ans.	**Explain with neat sketch Symon's rain gauge.** 1. Simon's rain gauge is a non recording type of rain gauge which is most commonly used. 2. It consists of metal casing of diameter 127mm which is set on a concrete foundation. 3. A glass bottle of capacity about 100mm of rainfall is placed within the casing.		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	**A) b)**	4. A funnel with brass rim is placed on the top of the bottle. 5. The rainfall is recorded at every 24 hours. 6. To measure the amount of rainfall the glass bottle is taken off and the collected water is measured in a measuring glass and recorded in rain gauge record book.  	***2 marks for explanation*** ***2 marks for diagrams***	**4**
	c)	**Calculate the maximum flood discharge for a catchment area 1500 km^2 using Dicken's formula. Assume Dicken's coefficient as 28.**		
	Ans:	By Dicken's formula: $$Q = C \times A^{3/4}$$	***2***	**4**
		$$= 28 \times 1500^{3/4}$$		
		$$= \mathbf{6748.79}\ m^3/s$$	***2***	
	d)	**State the meaning of:**		
	Ans:	**i) GCA :** The total area enclosed between an imaginary boundary line which can be included in an irrigation project for supplying water to agricultural land by network of canal is called GCA.	***1***	
		ii) Delta: Delta is total depth of water required by a crop during the entire period of the crop from first to last watering for complete maturity of the crop.	***1***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	**A)**			
		iii) Duty: It is the area in hectares irrigated by constant supply of water at the rate of one cumec throughout the base period for a particular crop.	*1*	**4**
		iv) Crop Period: It is the period in number of days that crop takes from the instant of its sowing to that of its harvesting.	*1*	
	B)			
	a)	**A tank has a catchment area of 120 km^2 out of which 20 km^2 is independent. The average annual rainfall of the catchment is 80 cm. The runoff of average bad year is 20 % of the rainfall for an average bad year. The runoff from the intercepted catchment available for this tank is 20% of actual runoff. Calculate the assured yield.**		
	Ans:	Total catchment area = 120 km^2		
		Intercepted catchment area = 100 km^2		
		Rainfall annual = 80 cm		
		Rainfall in bad year = $\frac{(80 \times 80)}{100}$ = 64 cm	*1*	
		Runoff from independent and intercepted catchment area is 20% of rainfall of average bad year.	*1*	
		$R_{(independent)} = \frac{20 \times 64}{100} = 12.8$ cm	*1*	
		$R_{(intercepted)} = \frac{20 \times 12.8}{100} = 2.56$ cm		**6**
		Yield from independent catchment area = 20 x 12.8 = 256 Ha-m	*1*	
		Yield from intercepted catchment area = 100 x 2.56 = 256 Ha-m	*1*	
		Total = 256+ 256 = 512 Ha-m	*1*	
	b)	**Fix the FRL, FFL and HFL from the following data(FFL considered as top dam level TDL)** 1. DSL = 110.00m 2. Effective live storage = 8000 m^3 3. Tank losses = 1500 m^3 4. Maximum flood discharge = 400 m^3/sec 5. Length of waste weir = 100 m 6. Francis formula Q = 1.8 LH$^{3/2}$ 7. Free board = 1.5 m		

Contour RL →	110	112	114	116	118	120
Capacity in m^3	1000	3000	5000	6000	9000	12000

	Ans:	Effective live storage = 8000 m^3		
		Tank losses = 1500 m^3	*1*	
		Total live storage = 9500 m^3		
		Dead storage = 1000 m^3 (corresponding to RL 110)	*1*	
		Gross storage = 9500 m^3 + 1000 m^3 = 10500 m^3		

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q.1.</td><td></td><td>Therefore,
RL corresponding to gross storage = $118 + \frac{2 \times 1500}{3000} = 119m$

F.R.L=119m
Flood lift H -
$Q = 1.8\ LH^{3/2}$
$400 = 1.8 \times 100 \times H^{3/2}$
H=1.703m
HFL = FRL + Flood lift
=119+1.703
=120.703
TDL(FFL)= HFL + free board
=120.70 + 1.5
=122.20</td><td>1

1

1

1</td><td>6</td></tr>
<tr><td>Q.2.</td><td>a)

Ans:</td><td>State the various cropping pattern seasons and crops in Maharashtra.

<table>
<tr><th rowspan="2">Sr. no.</th><th rowspan="2">Season</th><th colspan="2">Period</th><th rowspan="2">Base period</th><th rowspan="2">Weather</th><th rowspan="2">Common crops</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>1</td><td>Kharif</td><td>15 June</td><td>14 oct</td><td>123</td><td>Warm/ humid</td><td>Rice, jawar, cotton, tur, Groundnut, udid, etc</td></tr>
<tr><td>2</td><td>Rabi</td><td>15 oct</td><td>14 feb</td><td>122</td><td>Cool/dry</td><td>Wheat, gram, linseed</td></tr>
<tr><td>3</td><td>Hot weather</td><td>15 feb</td><td>14 June</td><td>120</td><td>Hot/dry</td><td>Only irrigated crops like vegetable, rice</td></tr>
<tr><td>4</td><td>Eight monthly</td><td>15 June</td><td>14 feb</td><td>245</td><td>--------</td><td>Tobacco, cotton, tur, groundnut</td></tr>
<tr><td>5</td><td>Annual</td><td>15 June</td><td>14 June</td><td>365</td><td>--------</td><td>Sugarcane, orchid</td></tr>
</table></td><td>1 mark each

(any four)</td><td>4</td></tr>
<tr><td></td><td>b)
Ans:</td><td>Enlist eight criteria for selection of site for a dam.
The selection criteria for site of a dam is-
1. Good foundation should be available.
2. It should be located in a narrow valley
3. It should have sufficient space for spillway
4. It should have impervious bed and site so as to reduce erosion
5. It should fulfill the purpose i.e. irrigation, drinking etc.
6. Materials should be easily available near by site
7. It should have less submergence area i.e. not more than 10%
8. The site should be such that the length of dam should be minimum as it directly affect cost
9. It should be easily accessible throughout the year.</td><td>1/2 marks each (any eight)</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.2	**c) Ans:**	**Differentiate between earthen and gravity dam with respect to foundation, seepage, construction and maintenance.**	***1 mark each***	**4**

Criteria	**Earthen dam**	**Gravity dam**
Foundation	They can be founded on any soil	They cannot be founded on any soil without proper foundation
Seepage	There is more seepage through the body of the dam and it's foundation compared to gravity dam	Comparatively there is less seepage in case of gravity dam
Construction	1.For its construction skilled labours are not required 2.Construction cost of earthen dam is less 3.For earth dams the diversion of flow during construction is costly	1.For its construction skilled labours are required 2.Construction cost of gravity dam is more 3. the diversion of flow during construction of gravity dam is costly
Maintenance	Maintenance cost of earthen dam is more	Maintenance cost of gravity dam is less

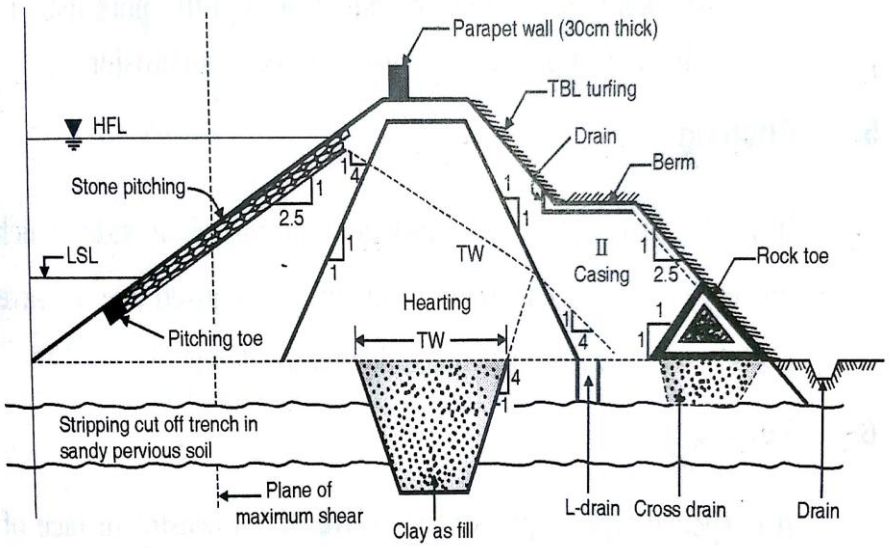
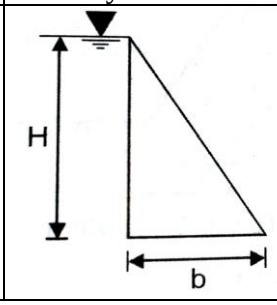
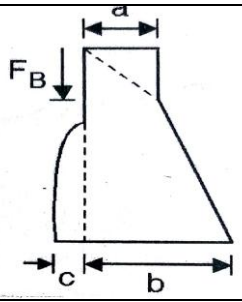
d) **Write the functions of the following components of earthen dam.**

i) Turfing
ii) Berms
iii) Hearting
iv) Rock toe

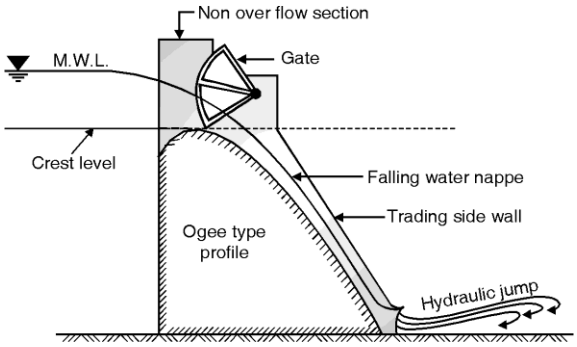
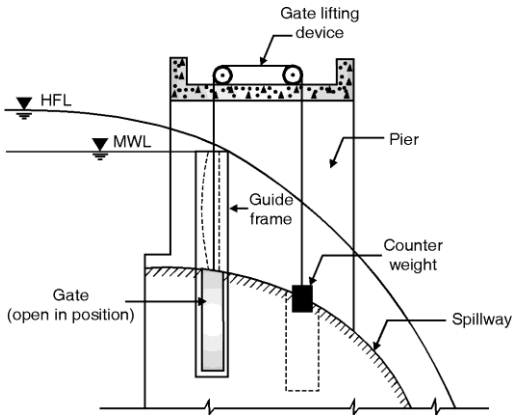
Ans:

1. **Turfing:** It is special type of grass planted over the downstream face of the dam, which protect downstream slope from eroding action of rain water.
2. **Berms:** a) It provides road way for vehicle.
   b) It reduces velocity of rainwater falling on slope.
   c) It collects rain water and disposes it off safely.
   d) It provide minimum cover of 2 m above seepage line
3. **Hearting:** a) It provides water tightness to the dam and resistance against slipping.
   b) It controls seepage flow through the body of dam.
4. **Rock toe:** a) It helps to prevent slogging of toe due to seepage flow and increases the stability of dam.
   b) It increases the stability of dam

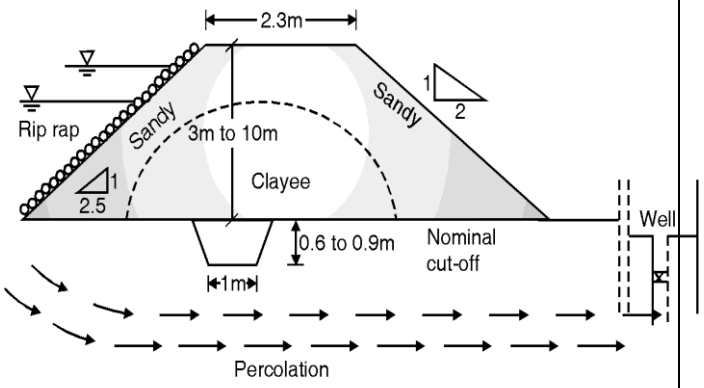
1 mark each **4**

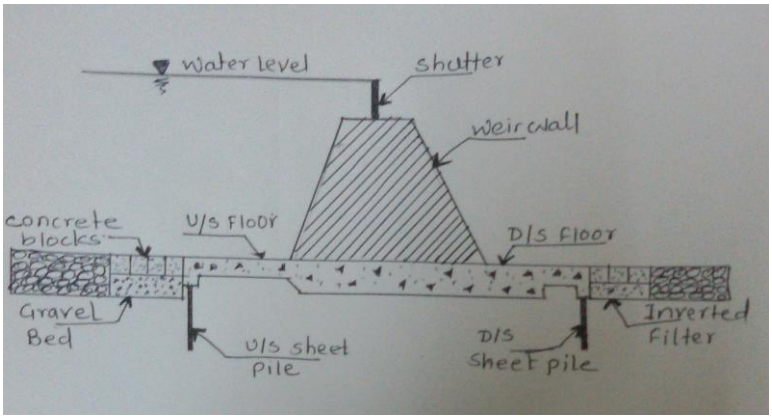
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.2	**e)** **Ans:**	**Draw a neat sketch of cross section of zoned type earthen dam and show all components of it.**  	***2 marks for labeling*** ***2 marks for neat sketch***	**4**
	f) **Ans:**	**Differentiate between elementary profile and practical profile of gravity dam.** **Sr. no.** / **Elementary profile** / **Practical profile** 1 / Provision of free board is not provided. / Provision of free board is provided. 2 / Road way at top is not possible. / Road way at top is possible. 3 / For reservoir empty condition it will provide maximum possible stability. / For reservoir empty condition tension is developed at toe and hence some masonry is provided on u/s side. 4 /  / 	***1 mark each***	**4**

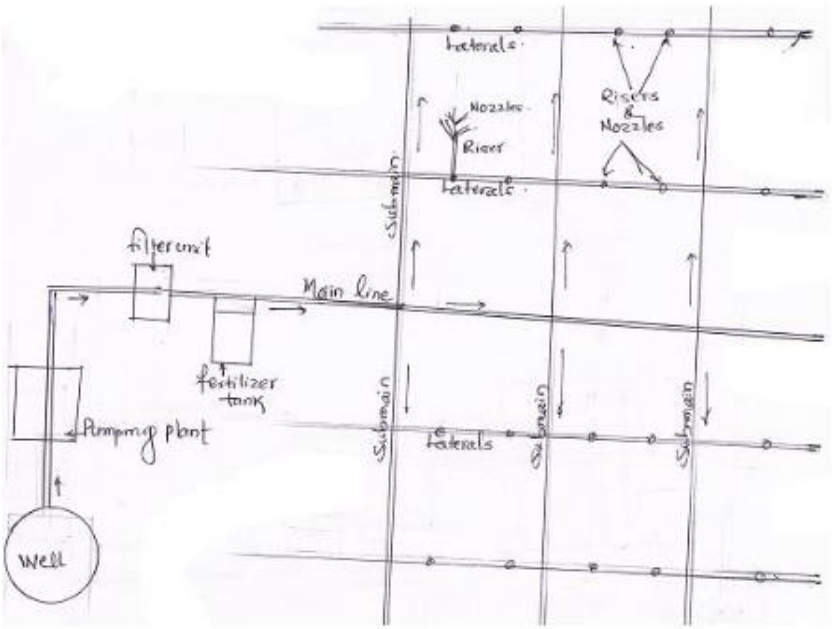
Que. No.	Sub. Que.	Model Answers	Mark	Total Marks
Q.3	**a)**	**State and explain the different conditions of stability of gravity dam**		
	Ans.	Stability requirement for gravity dam : 1. **Resistance to sliding** The horizontal forces causing sliding should not be more than resistance available at that length of dam $F.S\ against\ sliding = \frac{\varepsilon(U-V)\mu}{\varepsilon H}$ U-V = net vertical force U = Uplift μ = coefficient of friction ∑ H = Sum of all horizontal forces 2. **Resistance to compressive stresses** The actual stress should not exceed the crushing strength of the material for the reservoir full and empty condition. The compressive stress of masonry should not exceed permissible limits 3. **Resistance to Tension** There should not be tension at any point on a horizontal plate and resultant of all forces must pass through middle third and sum of moment about any point, where resultant cuts the base should be zero 4. **Resistance to overturning.** The dam must be safe against overturning the factor of safety about toe should be 2 to 3. $Factor\ of\ safety = \frac{Moments\ of\ stabilizing\ forces}{Moments\ of\ overturning\ forces}$	***1 mark each***	**4**
	b)	**State importance of spillway in earthen dam and explain construction and working of ogee spillway with sketch**		
	Ans.	It is an arrangement provided at the crest of dam to expel the excess water rises above the full reservoir level. This is necessary otherwise water will go on rising even above HFL and will start flowing from top of dam which may affect stability of dam. Therefore it is very essential to provides spillway to dispose surplus water on downstream side. **OGEE spillway** The shape of spillway is ogee or S shaped. The main difference between free over fall spillway and ogee spillway is that in case of free over fall spillway water flowing over the crest of spillway drops	***1*** ***1***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.3		vertically as free set where in ogee shaped spillway water is guided smoothly over the crest and is made to guide over the downstream face of the spillway.  Ogee-spillway It is ideal spillway as water flowing over the crest of spillway always remains in contact with the surface spillway.	***2***	**4**
	c)	**Draw labeled sketch of vertical sliding gate state where it is suitable**		**4**
	Ans.	 **vertical sliding gate**	***1 mark for labeling*** ***2 marks for neat sketch***	
		These are suitable for span more than 15 m	***1***	**4**
	d)	**State the advantages and disadvantages of bandhara irrigation scheme**		
	Ans.	**Advantages of Bandhara Irrigation** 1. The system of irrigation is economical 2. The irrigated area is compact and hence irrigation is intensive, length of canal is less, transit losses are also less, all these factors lead to high duty of water. 3. The water of small catchments which would otherwise have gone waste is fully utilized	***1 mark each (any two)***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.3	**d)**	**Disadvantages of Bandhara Irrigation** 1. As irrigable area is fixed if more water is available for irrigation it cannot be used. 2. There might be uncertainty of supply of water in case of non Perennial River. 3. If number of bandharas are constructed on a stream downstream people may be adversely affected.	***1 mark each (any two)***	**4**
	e) **Ans.**	**State the main features of lift irrigation scheme** **Features of lift irrigation scheme are as follows:-** (1) Intake channel. (2) Inlet chamber (3) Jack well (4) Inlet pipe joining inlet chamber (5) Engine house (6) Rising main (7) Delivery chamber (8) Water distribution system (9) Pumping machinery.	***½ mark each*** ***(any eight)***	**4**
Q.4	**A)** **a)** **Ans.**	**Describe construction of percolation tank** Construction of percolation tank is as follows:- The only component of these scheme is earthen bund may be in single or straight alignment with cut off trench A cut off trench of 30 to 90 cm depth and 60 to 120 cm bottom width which is constructed with locally available material like moorum, soft rock, black cotton soil and stones for chipping. The earthen bund consisting of sandy casing &clayee hearting for retaining water on u/s side. The central core portion of bund is compacted, properly by adding proper moisture and then sandy type of soil is placed on this core as a cover with compaction and upstream. Side is packed with boulders or stones. Riprap is provided to protect the u/s slope of bund. Cut off trench is provided at the centre of hearting in foundation of tank. Percolation tanks are constructed on pervious soils so that percolation of water takes place through foundation soil & will be available on d/s in wells for lift irrigation when required. If height if bund will not generally exceed the limit of 10m. The drainage arrangement should be provided in the bund seat to avoid slips by saturation	***3***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.4	**a)**		*1*	**4**
	b)	**Compare between drip irrigation and sprinkler irrigation on any four points**		
	Ans.	<table><tr><th>Sr. No.</th><th>Drip irrigation</th><th>Sprinkler irrigation</th></tr><tr><td>1.</td><td>Initial investment is more.</td><td>Initial investment is less as.</td></tr><tr><td>2.</td><td>Dripping valves are present in drip system</td><td>Spray guns and nozzles are used in sprinkler system.</td></tr><tr><td>3.</td><td>Only the root area is wetted by drip irrigation</td><td>Sprinkler wets an area of a circle, which covers a number of plants. more area is wetted by this system</td></tr><tr><td>4.</td><td>Drip irrigation prevents the spreading of diseases</td><td>sprinkler system does not prevent the spreading of diseases</td></tr><tr><td>5.</td><td>Run off and evaporation is less in sprinkler method.</td><td>Run off and evaporation is higher in sprinkler method.</td></tr><tr><td>6.</td><td>The effectiveness and efficiency is higher in drip irrigation</td><td>the effectiveness and efficiency is lesser in sprinkler irrigation</td></tr></table>	***1 mark each*** ***(any four)***	**4**
	c) **Ans.**	**Write any eight component parts of diversion headwork** A diversion head work consist of following component : (1) Weir (barrage) (2) Under sluice/ scouring sluices (3) Fish ladder (4) Divide wall (5) Canal head regulator (6) Silt excluder (7) Guide bank (8) Marginal bunds	***½ mark each***	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.4	**d) Ans.**	**State different types of weir draw labeled sketch of any one type** **Weirs are mainly classified as follows** 1) Gravity weir. Depending on material and design features, gravity weirs are subdivided into following types- (i)Vertical drop weir. (ii) Sloping weir a. Rock fill weirs. b. Concrete weirs. (2) Non gravity weir. **OR** **Weirs are also classified as follows :** (1) According to use and function. (1) Storage weir. (2) Pick up weir. (3) Diversion weir. (4)Waste weir. (2) According to control of surface flow. (3) According to the design of floors. (4) According to constructional material.  ***Note: Any relevant sketch related to weir should be considered.***	***2 Marks for classification*** ***2 marks for sketch***	**4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.4	**B) a)** **Ans.**	**State the needs of sprinkler irrigation scheme draw layout of sprinkler irrigation scheme and show various components of it.** **Need or necessity:** Sprinkler irrigation is best suited for very light soils as percolation losses at higher depth are prevented. This irrigation method can be used for all the crops but not suitable for the crops like rice, jute, sugarcane, jawar etc. for which standing water is required. This method is more flexible to suit undulating topography, therefore levelling for land is not necessary. It is quite suitable for lawns in the garden; small height crops etc  	***2*** ***2 mark for sketch*** ***2 mark for labeling***	**6**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.4	**b)**	**Calculate the balancing depth for a section of a canal having following data b = 10m FSD = 1.5 bank width = 2m side slope 1:1 in cutting and 1.5:1 in filling free board 0.5m**		
	Ans.	Given : b = 10m , FSD = 1.5m, z_c = 1:1, z_f = 1.5:1, FB = 0.5m Let 'dc' be the balancing depth. h = height of bank above GL = (1.5 + 0.5 – dc) **h = (2 – dc)**	***1***	**6**
		∴ Area of cutting = (b + zd) d = (10 + 1 × dc) - dc = (10 + dc) · dc Area of filling = 2 (Area of banking) = 2 (2 + 1.5 h) -h Put h = 2 – dc ∴ Area of filling = 2 [2 – 1.5 (2 – dc)] (2 – dc) = 20 – 16 dc – 3 dc^2	***2***	
		Area of cutting = Area of filling ∴ (10 + dc) dc = 20 – 16 dc + 3 dc^2 0 = 10 – 13 dc + dc^2 **dc = 0.82 m**	***2*** ***1***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.5	**a)**	**Following table gives the necessary data about the crops, their duty and the area under each crop commanded by the canal taking off from storage reservoir. Find the reservoir capacity if the canal losses are 20% and reservoir losses are 12%**		

Crop	Base Period (days)	Area under the crop (Ha)	Duty at the field (Ha/Cumec)
Wheat	120	4800	1800
Sugar Cane	360	5600	800
Cotton	200	2400	1400
Vegetables	120	1400	700
Rice	120	3000	800

(I) Wheat:

Discharge = Area/Duty

Discharge Required = 4800/1800 cumecs

Volume of water reqquired = Discharge x Base Period

= 4800/1800 x 120

= 320 cumec-days — ***1***

(II) Sugar cane:

Discharge Required = 5600/800 cumecs

Volume of water required = 5600/800 x 360

= 2520 cumec-days — ***1***

(III) Cotton:

Discharge Required = 2400/1400 cumecs

Volume of water reqquired = 2400/1400 x 200

= 342 cumec-days — ***1***

(IV) Vegatables:

Discharge Required = 1400/700 cumecs

Volume of water reqquired = 1400/700 x 120

= 240 cumec-days — ***1***

(V) Rice:

Discharge Required = 3000/800 cumecs

Volume of water reqquired = 3000/800 x 120

= 450 cumec-days — ***1***

Hence total vo;ume of water required on the field,

= 320+2520+342+240+450

= 3872 cumec-days

1 cumec-days = 1 cumec meter flowing for whole day

= (1 x24 x60 x 60)/10^4 Ha – m

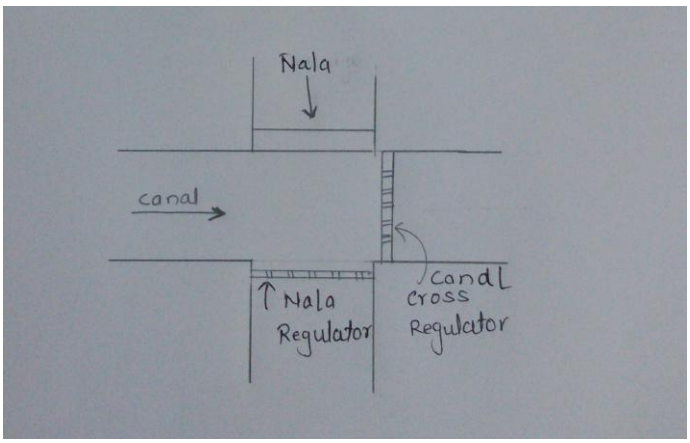
= 8.64 Ha -m — ***1***

Total Volume of water = 3872 x 8.64

= 33454 Ha — ***1***

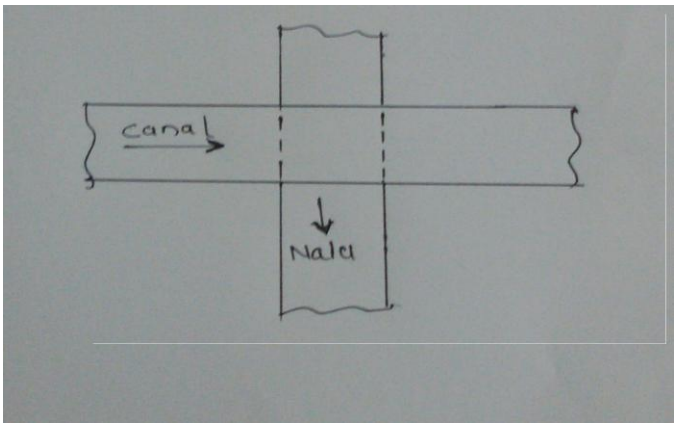
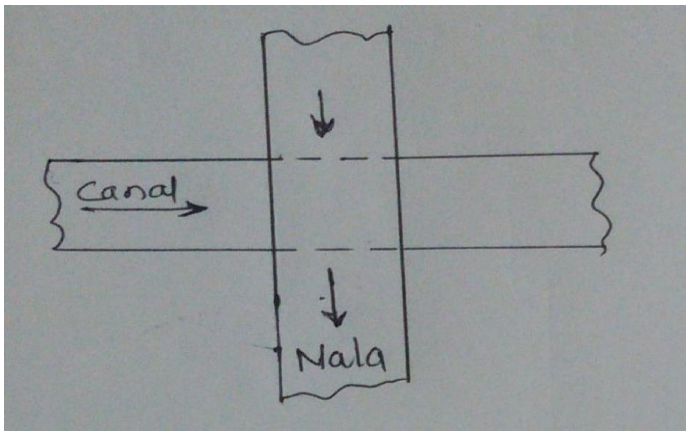
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.5	**a)**	Considering losses in canal system as 20 % Volume of water required = 33454 x (100/80) = 41817.5 Ha -m And taking 12 % reservoir losses, storage capacity = 41817.5 x (100/88) = 471519.89 Ha - m	***1***	**8**
	b)	**Explain the type of failure in earthen dam and its remedial measures.**		
	Ans.	**1. Hydraulic failures: -** About 40% of earthen dam failures due to this reason only. It includes Overtopping of dam surface, failure of u/s slope due to wave erosion, toe erosion, gullying etc. These failures can be avoided by taking following remedial measures. **a. Overtopping**: i. Proper design of spillway capacity. ii. Providing sufficient free board. **b. Failure of u/s slope: -** Protection by providing stone pitching or riprap. **c. Toe erosion**: -By providing stone pitching or riprap **d. Gullying: -** i. By providing turfing or hariyali and stone laying on d/s slope. ii. By providing berms.	***3***	**8**
		2. Seepage failures: - More than 33% of earthen dam failures due to seepage. Seepage always occurs in earthen dam. It does not harm its stability if it is within design limit. It includes Piping, Sloughing. These failures can be avoided by taking following remedial measures. 1) Proper compaction & bonding between layers. 2) Careful investigations of foundation soil 3) Proper design	***1***	
		a. Sloughing: Causes due to -Full reservoir condition, highly permeable soil strata are present in foundation of dam permits seepage of water through it causing erosion of soil, which result in piping.	***1***	
		3. Structural Failure: - About 25% to 30%of the dam failures due this reason. It includes u/s & d/s slope slide; slope protection failure; failure due the earthquake. These failures can be avoided by taking following measures.		

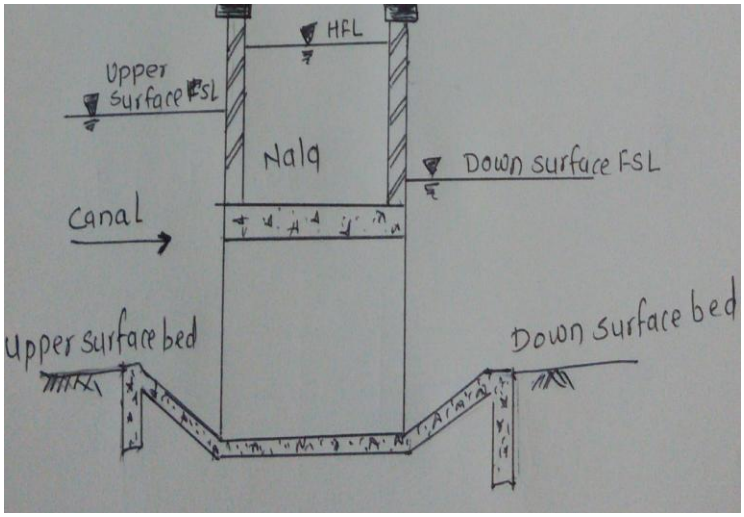
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.5	**b)**	**a. U/s & d/s slope slide: -** Care should be taken that excessive pore pressure should not be formed during construction of the dam. **b. Slope protection failure: -** Avoid steep slope, regular maintenance of slope. **c. Failure due the earthquake**: - Earthquake pressure should be considered while designing of the dam.	***3***	
	c)	**Suggest the suitable type of CD work and draw the sketch of it under each of the following sititutions.** **i) Canal bed level and Nala Bed level are same** **ii) Canal bed level is above HFL of Nala** **iii) Nala bed level is above FSL of canal.** **iv) HFL of Nala is between FSL of canal & bed level of Canal.**		
	Ans.	**i) Canal bed level and Nala Bed level are same:**	***2***	



Level Crossing

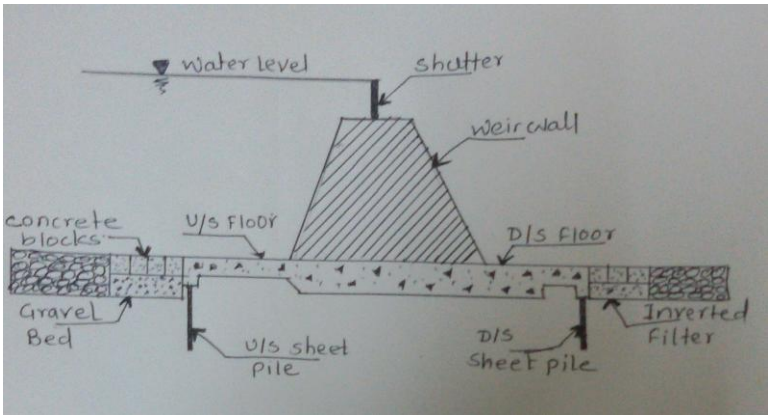
1. The RL of canal bed & RL of Nala are pratically same.
2. The discharge of Nala & that of canal is app of the same magnitude.
3. No other structure is economically feasible.

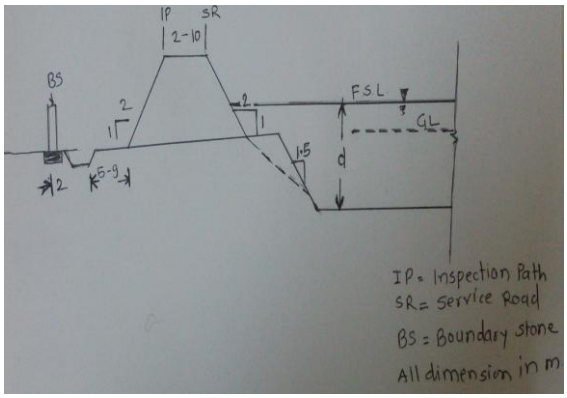
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
		ii) Canal bed level is above HFL of Nala  **Aqueduct** 1. The discharge of Nala is more in comparison to Canal discharge. 2. The bed level of canal is sufficiently above the high flood level of Nala.	***2***	
		iii) Nala bed level is above FSL of canal  **Super passage** 1. The bed level of drainage is above the full supply level of canal. 2. The water of the canal passes clearly below the drainage.	***2***	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.5	**c)**	**iv) HFL of nala is between FSL of Canal and bed level of canal**  1. The nala bed is at higher level than FSL of canal. 2. The clearance between Nala bed * FSL of canal is either insufficient or the Nala bed is lower than FSL of canal but higher than the bed of canal.	***2***	**8**
Q.6	**a)** **Ans.**	**Differentiate between wear & barrage with respect to** **i. Cost. ii. Silting, iii. Flood Control** **iv. Area of submergence.**		

Weir		**Barrage**	
i.	Initial cost is low.	i.	Initial cost is high.
ii.	Due to crest there is problem of silting.	ii.	There is good control over silt entry into canal
iii.	Control over the flood is not possible.	iii.	Good control over the flood situation.
iv.	Area of submergence is more due to large afflux.	iv.	Area of submergence is less due to less afflux.

1mark for each **4**

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.6	**b)**	**State the four types of Weirs. Draw a sketch of any one and describe its purpose.**		
	Ans.	(1) Gravity weir. Depending on material and design features, gravity weirs are subdivided into following types- (i)Vertical drop weir. (ii) Sloping weir a. Rock fill weirs. b. Concrete weirs. (2) Non gravity weir. OR Weirs are also classified as follows : (2) According to use and function. (1) Storage weir. (2) Pick up weir. (3) Diversion weir. (4)Waste weir. (2) According to control of surface flow. (3) According to the design of floors. (4) According to constructional material.	***½ Mark each (any four)***	**4**
		Purpose of vertical drop weir :- The raised masonry crest does the maximum ponding of water and a part of it is being done by the shutters at the top of the crest.	***1***	
			***1***	
		Sketch of vertical drop weir ***(Note: any relevant sketch related to weir should be considered.)***		

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.6	**c)**	**Draw the cross section of canal in partial cutting and partial embankment.**  	***2 marks for sketch*** ***2 mark for labeling***	**4**
	d)	**What do mean by canal lining? State two purposes, advantages and disadvantages of canal lining.** Lining of canal means providing impervious thin layer of 2.5 to 15 cm thickness to protect the bed and sides of canal. **Purposes of lining** 1. To reduce the seepage losses in canal. 2. To prevent scouring of bed sides. 3. To improve the discharge of canal by increasing the velocity of flowing water. 4. To prevent water logging. 5. To increase the capacity of canal. 6. To increase the command area. 7. To control the growth of weeds. 8. To protect the canal from the damage by flood. **Advantages :** 1. It reduces the loss of water due to seepage and hence the duty is enhanced. 2. It controls the water logging. 3. It provides smooth surface and hence the velocity of flow can be increased. 4. Due to the increased velocity the discharge capacity of canal is also increased. 5. Due to the increased velocity the evaporation also is reduced. 6. It eliminates the effect of scouring in the canal bed.	***1*** ***½ mark each (any two)*** ***½ mark each (any two)***	

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q.6</td><td>d)</td><td>7. The increased velocity eliminates the possibility of silting in the canal bed.
8. It controls the growth of weeds along the canal sides and bed.
9. It provides the stable section of the canal.
10. It prevents the sub soil salt to come in contact with the canal water.
11. It reduces the maintenance cost of canal.
Disadvantages
1. The initial cost of canal lining is very high.
2. It involves much difficulty for repairing the damaged section of lining.
3. It takes too much time to complete the project work.
4. It becomes difficult if the outlets are required to be shifted or new outlets are required to be provided because dismantling of the lined section is difficult.</td><td>½ mark each (any two)

½ mark each (any two)</td><td>4</td></tr>
<tr><td></td><td>e)

Ans.</td><td>Differentiate between head regulator and cross regulator.
<table><tr><th>Head regulator</th><th>Cross regulator</th></tr><tr><td>i. These are constructed at off take point.</td><td>i. These are constructed in main canal or parent canal d/s of off take canal.</td></tr><tr><td>ii. It regulates the supply of taking canal.</td><td>ii. It regulates the supply of parent canal.</td></tr><tr><td>iii. It controls silt entry in the off taking canal.</td><td>iii. Already silt is controlled by head regulator.</td></tr><tr><td>iv. It helps in shutting off the supplies when not needed in off-taking canal or when the off-taking channel is required to be closed for repairs.</td><td>iv. It helps in closing the supply to the d/s of parent channel for purpose of repairs etc.</td></tr></table></td><td>1 mark each</td><td>4</td></tr>
</table>