

**IRRIGATION ENGINEERING**

Time: Three Hours

Full Marks 100  
(50 marks for each part)

Use a separate Answer-Script for each part

Question No.	Part I	Marks
<i>Answer any TWO questions from this part. Assume suitable values for the parameters if not supplied.</i>		
1	(a) Discuss briefly the importance of sediment transport study of a canal.	2
	(b) What are different types of sediment load? Discuss briefly. What is 'Threshold of motion'?	3+1=4
	(c) Show the curve for 'Shield's Entrainment Function' vs. 'Particle Reynold's Number' for laminar flow of bed through turbulent movement of bed, and then prove that, $d = 11RS$ for channels in course alluvium.	3+3=6
	(d) Explain Lacey's theory for regime channel. Also explain true regime, initial regime and final regime.	2+3x2=8
	(e) Derive the expression for 'Average Unit Tractive' force for a canal. Show the diagram for the distribution of tractive force generated in a trapezoidal channel section.	3+2=5
2	(a) Prove that the shear stress required for moving a grain on the bank is less than the shear stress required for moving the grain on bed.	5
	(b) A canal is to be designed to carry a discharge of 65 cumecs. The slope of the canal is 1 in 1500. The soil is coarse alluvium having a grain size of 5cm. Assuming the canal to be unlined and a trapezoidal section with free board 0.5m on top of the flow surface level, determine a suitable section for the canal, the angle of shearing resistance may be taken as $37^\circ$ . Also provide a schematic diagram for the canal section.	8
	(c) Calculate the balancing depth for a channel section having a bed width 15 m and side slopes of 1(H):1(V) in cutting and 1.5(H):1(V) in filling. The bank embankments are kept 3.0m higher than the ground level (berm level) and crest width of banks is kept as 2.0 m.	5
	(d) What is the utility of providing a berm and back berm on either side of canal?	7
3	(a) How the rivers can be classified on the basis of topography? Explain briefly.	1+4=5
	(b) How the river flood plain can be classified? Explain briefly.	1+4=5
	(c) Differentiate between 'bends' and 'meanders' of rivers. Explain the causes of meandering?	2+3=5
	(d) What are the governing variables for meander process? Explain briefly.	5
	(e) What are the meander indices? Explain briefly.	5

**B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER  
SUPPLEMENTARY EXAM 2018 (OLD)**

~~(1st/2nd Semester/Repeat/Supplementary/Spl. Supplementary/Old/Annual/Bi-Annual)~~

**SUBJECT: IRRIGATION ENGINEERING**

(Name in full)

**PAPER ××××**

Time: ~~Two hours/ Three hours/Four hours/Six hours~~

Full Marks ~~30/100~~  
(15/50 marks for each part)

Use a separate Answer-Script for each part

No. of  
Question

**Page: 1 of 2**

Marks

Part -II

- Question no.4 is mandatory, answer any other two questions alongwith question no.4
- Maintain neatness.
- Assume reasonable values of data if it is not supplied.
- All drawings-must be drawn by pencil
- No code etc. will be needed to answer the questions of this part

- |        |  |       |
|--------|--|-------|
| (1)(a) | Why curves should be avoided in the alignment of canal as far as possible? If unavoidable, then what measures should be taken to provide a curve in canal?   | 4     |
| (b)    | Differentiate between any two:<br>i) Flow duty and quantity duty,<br>ii) Natural sub irrigation and artificial sub irrigation,<br>iii) Intensive irrigation and extensive irrigation.  | 2x2=4 |
| (c)    | The drip system of irrigation is an excellent method but not used in India in large scale" why?  | 6     |
| (d)    | What are the main crop sessions in India?  | 4     |
| (2)(a) | Deduce a relationship among duty, delta and base period  | 5     |
| (b)    | Discuss 'check flooding' method of application of irrigation water to the field with the help of a neat sketch.  | 6     |
| (c)    | A tube well discharges @136 m <sup>3</sup> /hour. If the tube well works for 3000 hours per year, estimate the culturable area that the tube well can command. The intensity of irrigation is 50% and the average water depth required for the rabi and kharif crops is 51 cm.   | 5     |
| (d)    | What is meant by 'consumptive use of water' for a crop?  | 2     |
| (3)(a) | The C.CA for a distributary is 15000 hectares. The I.I. for Rabi (wheat) is 40% and for Kharif (rice) is 15%. If the total water requirement of the two crops are 37.5 cm and 120 cm and their periods of growth are 160 and 140 days respectively,<br>(i) determine the out let discharge from average demand considerations,<br>(ii) also determine the peak demand discharge,<br>Assuming that "the Kor water depths" for two crops are 13.5 cm and 19 cm and their kor periods are 4 weeks and 2 weeks respectively. | 8     |
| (b)    | Explain the ways through which irrigation canals can be aligned.   | 7     |
| (c)    | How flow irrigation differs from lift irrigation?  | 3     |
| (4)(a) | On which factors, seepage losses depend?   | 3     |
| (b)    | What is meant by benefit cost ratio?   | 2     |
| (c)    | An unlined canal giving a seepage loss of 3.0 cumecs per million square metres of wetted area is proposed to be lined with 10cm thick cement concrete lining, which costs Rs.180/- per 10 square metres. Given the following data work out the economics of lining & benefit cost ratio:<br>(i) Life of lining: 50 years<br>(ii) Discharge in the channel: 80 cumecs   | 9     |

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Ref No. Ex/CE/T/312/2018(S)(OLD)

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(.....Continued from earlier page)

- (4)(c) (iii) Annual revenue per cumec of water from all crops Rs.3.6 lakhs.  
(iv) Area of the channel: 40m<sup>2</sup>  
(v) Wetted perimeter of the channel: 17.8m  
(vi) Wetted perimeter of the lining: 17.6 m  
(vii) Annual maintenance cost of unlined channel: Rs. 1.0/per 10 m<sup>2</sup>.  
(viii) Seepage loss in lined canals: 0.07 cumec per million m<sup>2</sup> wetted area  
(ix) Percentage savings of annual maintenance charges in lined canals, out of annual maintenance charges for unlined canal: 38%  
(x) Rate of interest: 8%