Course Code:19AG0725 **R19**

SIDDHARTH INSTITUTE OF ENINEERING AND TECHNOLOGY :: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Hydrology, Ground water & well engineering(19AG0725) **Course & Branch**: B.Tech– AGE

Year & Sem: IV-B.Tech & I-Sem **Regulation:** R19

UNIT-I

1.	**a.**	Define hydrology? Write in detail about hydrology cycle and its components with diagram?	[L1][CO1]	**[10M]**
	b.	Explain briefly on precipitation?	[L4][CO1]	**[2M]**
2.		Define rainfall? List the types of raingauges and explain recording raingauges with diagram	[L1][CO1]	**[12M]**
3.	**a.**	Write in detail about raingauges?	[L1][CO1]	**[6M]**
	b.	Explain about non-rainguages with diagram?	[L2][CO1]	**[6M]**
4.		Write the different methods of presentation of rainfall data with suitable diagram?	[L2][CO1]	**[12M]**
5.	**a.**	Explain isohyetal method in detail with diagram	[L1][CO1]	**[6M]**
	b.	Write the different forms of precipitation?	[L4][CO1]	**[6M]**
6.	**a.**	Explain thiessen polygon method with one example?	[L2][CO1]	**[6M]**
	b.	Explain mass curve and hyetograph?	[L3][CO1]	**[6M]**
7.		Write in detail about different calculated mean precipitation over an area?	[L4][CO1]	**[12M]**
8.	**a.**	For the catchment area shown in fig, the details of theissen polygon surrounding each rainguages and recording of the rainguages in the month of august 2020 are given below.	[L1][CO1]	**[10M]**

Rainguage station	1	2	3	4	5	6
Thiessen polygon area(km^2)	720	380	440	1040	800	220
Recorded rainfall in mm	121	134	145	126	99	115

Determine the average depth of rainfall on the basin by arithmetic mean method and thiessen mean method

	b.	Explain briefly about rainguage?	[L1][CO1]	**[2M]**
9.	**a.**	Explain the probability analysis of rainfall by return period?	[L1][CO1]	**[7M]**
	b.	Analysis of data on maximum one-day rainfall depth at chennai at depth of 300 mm had a return period of 50 years. Determine the probability of one-day rainfall deoth equal to or greater than 300 mm occuring (a) once in 20 successive years (b) two times in 15 successive years and (c) at least once in 20 successive years	[L1][CO1]	**[5M]**
10.		Explain plotting position by weibulls method?	[L2][CO1]	**[12M]**

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UNIT-II

<table>
<tr><td>1.</td><td>a.</td><td>Explain briefly about hydrograph with its components</td><td>[L1][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b.</td><td>Explain unit hydrograph briefly?</td><td>[L1][CO2]</td><td>[6M]</td></tr>
<tr><td>2.</td><td></td><td>Explain the factors affecting hydrograph with necessary graphs?</td><td>[L1][CO2]</td><td>[12M]</td></tr>
<tr><td>3.</td><td>a.</td><td>Write the basic assumptions constitute the foundation for unit hydrograph</td><td>[L2][CO2]</td><td>[5M]</td></tr>
<tr><td></td><td>b.</td><td>Explain the derivation of unit hydrograph</td><td>[L2][CO2]</td><td>[7M]</td></tr>
<tr><td>4.</td><td></td><td>Following are the ordinates of storm hydrograph draining the catchment area of 423 Km^2 due to 6-h isolated storm. Derive the ordinates of 6-h unit hydrograph for the catchment
<table>
<tr><td>Time from start of storm(h)</td><td>-6</td><td>0</td><td>6</td><td>12</td><td>18</td><td>24</td><td>30</td><td>36</td><td>42</td><td></td></tr>
<tr><td>Discharge (m^3/s)</td><td>10</td><td>10</td><td>30</td><td>87.5</td><td>115.5</td><td>102.5</td><td>85.0</td><td>71.0</td><td>59.0</td><td></td></tr>
<tr><td>Time from start of storm(h)</td><td>48</td><td>54</td><td>60</td><td>66</td><td>72</td><td>78</td><td>84</td><td>90</td><td>96</td><td>102</td></tr>
<tr><td>Discharge (m^3/s)</td><td>47.5</td><td>39.0</td><td>31.5</td><td>26.0</td><td>21.5</td><td>17.5</td><td>15.0</td><td>12.5</td><td>12.0</td><td>12.0</td></tr>
</table></td><td>[L2][CO2]</td><td>[12M]</td></tr>
<tr><td>5.</td><td></td><td>Explain in detail about different methods of unit hydrograph for different duration</td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>6.</td><td>a.</td><td>Explain s-curve method briefly?</td><td>[L3][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b.</td><td>Explain concept and application of s-curve</td><td>[L3][CO2]</td><td>[6M]</td></tr>
<tr><td>7.</td><td>a.</td><td>Explain the conversion of unit graph duration by s-curve method</td><td>[L3][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b.</td><td>Explain the concept of synthetic unit hydrograph</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td>8.</td><td>a.</td><td>Explain about synders synthetic unit hydrograph</td><td>[L2][CO2]</td><td>[9M]</td></tr>
<tr><td></td><td>b.</td><td>Define basin lag, peak flow and time base of unit hydrograph</td><td>[L2][CO2]</td><td>[3M]</td></tr>
<tr><td>9.</td><td></td><td>Write in detail about instantaneous unit hydrograph?</td><td>[L2][CO2]</td><td>[12M]</td></tr>
<tr><td>10.</td><td>a.</td><td>Write the concept and application of IUH?</td><td>[L2][CO2]</td><td>[6M]</td></tr>
<tr><td></td><td>b.</td><td>Explain in detail about SCS triangular hydrograph?</td><td>[L2][CO2]</td><td>[6M]</td></tr>
</table>

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UNIT-III

1.	**a.**	Write short notes on water resources status of India.	[L1][CO3]	**[6M]**
	b.	Explain hydrologic zones present below the ground with neat sketch.	[L4][CO3]	**[6M]**
2.		Discuss the different groundwater regions of India.	[L1][CO3]	**[12M]**
3.	**a.**	State Darcy's law and derive Darcy's equation.	[L1][CO3]	**[9M]**
	b.	Write the validation of Darcy's law.	[L2][CO3]	**[3M]**
4.		What are the properties of aquifer and explain them in brief.	[L2][CO3]	**[12M]**
5.	**a.**	Write the types of water bearing formations and define each of them.	[L1][CO3]	**[6M]**
	b.	A field sample of an unconfined aquifer is packed in a test cylinder. The length and diameter of the cylinder are 50 cm and 6 cm, respectively. The field sample is tested for a period of 3 min under a constant head difference of 16.3 cm. As a result, 45.2 cm^3 of water is collected at the outlet. Determine the hydraulic conductivity of the aquifer sample.	[L4][CO3]	**[6M]**
6.	**a.**	Define: Groundwater, Hydraulic Head, Perched water table.	[L2][CO3]	**[3M]**
	b.	Write the classification of aquifer and explain them with neat diagram.	[L3][CO3]	**[9M]**
7.		In an unconfined aquifer extending over 4 km^2 , the water table was initially at 26 m below the ground surface. Sometime after an irrigation of 20 cm (full irrigation), the water table rises to a depth of 25.5 m below the ground surface. Afterward $1.5x10^6$ m^3 of groundwater was withdrawn from this aquifer, which lowered the water table to 27.5 m below the ground surface. Determine: (i) specific yield of the aquifer, and (ii) soil moisture deficit (SMD) before irrigation.	[L4][CO3]	**[12M]**
8.	**a.**	Name the regions of groundwater present in India.	[L1][CO3]	**[8M]**
	b.	Write down the equation for porosity, specific yield, transmissibility, hydraulic conductivity.	[L1][CO3]	**[4M]**
9.	**a.**	In an area of 200 ha, the water table declines by 3.5 m. If the porosity of the aquifer material is 30% and the specific retention is 15%, determine: (i) Specific yield of the aquifer, and (ii) Change in groundwater storage.	[L1][CO3]	**[6M]**
	b.	The average thickness of a confined aquifer extending over an area of 500 km^2 is 25 m. The piezometric level of this aquifer fluctuates annually from 10 m to 22 m above the top of the aquifer. Assuming a storage coefficient of the aquifer as 0.0006, estimate annual groundwater storage in the aquifer.	[L1][CO3]	**[6M]**
10.		Define: (a) Aquifer, (b) Storage co-efficent, (c) Specific retention, (d) Darcy's law, (e) Aquitard, (f) Semi-confined aquifer.	[L2][CO3]	**[12M]**

UNIT-IV

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1.	**a.**	Classify the types of wells	[L1][CO4]	**[6M]**
	b.	Derive equation for the steady radial flow in confined aquifers with neat sketch.	[L1][CO4]	**[6M]**
2.	**a.**	Mention the groundwater exploration techniques	[L1][CO4]	**[6M]**
	b.	Explain the steady flow to cavity wells with neat diagrams.	[L2][CO4]	**[6M]**
3.	**a.**	Discuss briefly about the types of subsurface groundwater exploration techniques	[L2][CO4]	**[6M]**
	b.	What are the methods of drilling of wells, Explain each of them	[L2][CO4]	**[6M]**
4.	**a.**	Briefly explain the design of open well	[L2][CO4]	**[9M]**
	b.	A masonry well is to be constructed in fine sand sub-soil formation. The discharge of the well is anticipated to be $15m^3/h$ under a depression head of 4m. determine the diameter of the well.	[L2][CO4]	**[3M]**
5.	**a.**	Write the basic principles in design of gravel pack and recommended values of pack-aquifer (P.A) ratios	[L3][CO4]	**[9M]**
	b.	What are the desirable characteristics of good gravel materials	[L3][CO4]	**[3M]**
6.	**a.**	Describe the four possible approaches for installing well screen and casing in place	[L3][CO4]	**[8M]**
	b.	Name the methods used for development of wells	[L3][CO4]	**[4M]**
7.	**a.**	Determine aquifer parameters by using Theis method	[L3][CO4]	**[6M]**
	b.	Drawdown was measured during a pumping test at frequent intervals in an observation well 200 ft from a well that was pumped at a constant rate of 500 ppm. Based on pump test data the value of W(u) is 1, drawdown 's' is 1 ft, 1/u is 1 and time t is 2 min. these measurements shows that the water level is still dropping after 4000 minutes of pumping. Therefore analysis of the data requires use of Theis method non-equilibrion procedure. Determine S and T for the aquifer.	[L2][CO4]	**[6M]**
8.	**a.**	Discuss briefly about well interference in confined and unconfined aquifer systems with neat labelled diagram.	[L2][CO4]	**[8M]**
	b.	Discuss the fracturing methods for development of wells	[L2][CO4]	**[4M]**
9.	**a.**	Explain the back-washing methods for developing wells	[L2][CO4]	**[6M]**
	b.	Write about multiple well systems	[L1][CO4]	**[6M]**
10.	**a.**	Determine the aquifer parameters by using Cooper-Jacob method of solution	[L2][CO4]	**[5M]**
	b.	Using Cooper-Jacobs method, determine transmissibility (T) and drawdown (S) for confined aquifer for r = 60m given pumping test data in table. By overlapping semi-logarithmic paper a straight line is fitted through the points 'Δs' is 0.40m and 't_o' is 0.39 min	[L2][CO4]	**[3M]**
	c.	Describe Chow's method of solution to determine the aquifer parameters.	[L3][CO4]	**[4M]**

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UNIT-V

1.	**a.**	Write short notes on groundwater exploitation and its advantage	[L1][CO5]	**[6M]**
	b.	What are the methods for estimation of groundwater potential	[L1][CO5]	**[6M]**
2.	**a.**	Mention the different artificial recharge techniques	[L1][CO5]	**[6M]**
	b.	Classify the types of indigenous pumps	[L3][CO5]	**[6M]**
3.	**a.**	Write the Windmill feasibility in water lifting	[L2][CO5]	**[6M]**
	b.	What are the types of solar powered water pumping system	[L1][CO5]	**[2M]**
	c.	Write advantages, disadvantages and applications of solar powered water lift	[L2][CO5]	**[4M]**
4.	**a.**	What is biogas? explain the types of biogas plants in brief	[L1][CO5]	**[6M]**
	b.	What is reciprocating pumps and explain its components in brief	[L1][CO5]	**[6M]**
5.	**a.**	A single-acting reciprocating pump has a piston of diameter 10 cm and stroke of 20 cm. The piston makes 40 double strokes per minute. The suction and delivery heads are 5 m and 10 m, respectively. Find (i) the discharge capacity of the pump in l/min, (ii) the force required to work the piston during the suction and delivery strokes, if the efficiency of the suction and delivery strokes are 50 and 60 per cent, respectively, and (iii) the hp required by the pump for its operation.	[L1][CO5]	**[3M]**
	b.	What are factors must be considered in selection of centrifugal pump	[L1][CO5]	**[6M]**
	c.	A pump lifts 100,000 litres of water per hour, against a total head of 20 metres. Compute the water horse power. If the pump has an efficiency of 75 per cent, what size of prime mover is required to operate the pump? If a direct drive electric motor with an efficiency of 80 per cent is used to operate the pump, compute the cost of electrical energy in a month of 30 days. The pump is operated for 12 hours daily for 30 days. The cost of electrical energy is 20 paise per unit.	[L4][CO5]	**[3M]**
6.	**a.**	Explain sump installation of centrifugal pump with neat labelled diagram	[L2][CO5]	**[3M]**
	b.	Discuss in detail about the trouble shooting of centrifugal pump	[L1][CO5]	**[4M]**
	c.	Describe the various efficiencies of centrifugal pump with expression	[L2][CO5]	**[5M]**
7.	**a.**	A certrifugal pump impeller has an inner diameter of 50 cm and its outer diameter is twice the inner diameter. Calculate the speed of the impeller (in rpm) at which the lifting of water will commence against a head of 15 m.	[L1][CO5]	**[3M]**
	b.	What is hydraulic ram? Describe the construction of hydraulic ram	[L2][CO5]	**[6M]**
	c.	State: D'Aubuisson's efficiency ratio and Rankine formula for efficiency of hydraulic ram	[L3][CO5]	**[3M]**
8.	**a.**	A hydraulic ram operates at a drive head of 3 m and a delivery head of 20 m. The flow through the drive pipe is 10 l/s and the discharge at the outlet of the delivery pipe is 1.2 l/s. Compute the efficiency of the ram adopting (i) D'Aubuisson's ratio and (i) Rankine's formula.	[L1][CO5]	**[3M]**
	b.	What is Mixed flow pumps and discuss Principle of operation	[L1][CO3]	**[5M]**
	c.	What are the advantages and disadvantages of vertical turbine pumps.	[L1][CO5]	**[4M]**
9.		Briefly discuss the vertical turbine pump with neat schematic diagram.	[L1][CO5]	**[12M]**
10.	**a.**	Define the terminology with expression: water horse power, shaft horse power, break horse power, input horse power	[L1][CO5]	**[6M]**
	b.	Define priming and explain in detail about air lift pumps?	[L1][CO5]	**[6M]**

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