Course Code:16AG723 **R16**

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

Subject with Code : Water Hydrology-Wells and Pumps (16AG723) **Course & Branch**: B.Tech– AGE

Year & Sem: IV-B.Tech & II-Sem **Regulation:** R16

UNIT-I

1.	**a.**	Write short notes on water resources status of India.	[L1][CO1]	**[6M]**
	b.	Explain hydrologic zones present below the ground with neat sketch.	[L4][CO1]	**[6M]**
2.		Discuss the different groundwater regions of India.	[L1][CO1]	**[12M]**
3.	**a.**	State Darcy's law and derive Darcy's equation.	[L1][CO1]	**[9M]**
	b.	Write the validation of Darcy's law.	[L2][CO1]	**[3M]**
4.		What are the properties of aquifer and explain them in brief.	[L2][CO1]	**[12M]**
5.	**a.**	Write the types of water bearing formations and define each of them.	[L1][CO1]	**[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][CO1]	**[6M]**
6.	**a.**	Define: Groundwater, Hydraulic Head, Perched water table.	[L2][CO1]	**[3M]**
	b.	Write the classification of aquifer and explain them with neat diagram.	[L3][CO1]	**[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 Afterward $1.5x10^6$ m^3 of groundwater was withdrawn from this aquifer, which lowered the water table to 27.5 m below the ground surface.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] [CO1]	**[12M]**
8.	**a.**	Name the regions of groundwater present in India.	[L1][CO1]	**[8M]**
	b.	Write down the equation for porosity, specific yield, transmissibility, hydraulic conductivity.	[L1][CO1]	**[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][CO1]	**[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	[L1][CO1]	**[6M]**

		as 0.0006, estimate annual groundwater storage in the aquifer.		
10.		Define: (a) Aquifer, (b) Storage co-efficent, (c) Specific retention, (d) Darcy's law, (e) Aquitard, (f) Semi-confined aquifer.	[L2][CO1]	**[12M]**

UNIT-II

1.	**a.**	Classify the types of wells	[L1][CO2]	**[6M]**
	b.	Derive equation for the steady radial flow in confined aquifers with neat sketch.	[L1][CO2]	**[6M]**
2.	**a.**	Mention the groundwater exploration techniques	[L1][CO2]	**[6M]**
	b.	Explain the steady flow to cavity wells with neat diagrams.	[L2][CO2]	**[6M]**
3.	**a.**	Discuss briefly about the types of subsurface groundwater exploration techniques	[L2][CO2]	**[6M]**
	b.	What are the methods of drilling of wells, Explain each of them	[L2][CO2]	**[6M]**
4.	**a.**	Briefly explain the design of open well	[L2][CO2]	**[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][CO2]	**[3M]**
5.	**a.**	Write the basic principles in design of gravel pack and recommended values of pack-aquifer (P.A) ratios	[L3][CO2]	**[9M]**
	b.	What are the desirable characteristics of good gravel materials	[L3][CO2]	**[3M]**
6.	**a.**	Describe the four possible approaches for installing well screen and casing in place	[L3][CO2]	**[8M]**
	b.	Name the methods used for development of wells	[L3][CO2]	**[4M]**
7.	**a.**	Determine aquifer parameters by using Theis method	[L3][CO2]	**[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][CO2]	**[6M]**
8.	**a.**	Discuss briefly about well interference in confined and unconfined aquifer systems with neat labelled diagram.	[L2][CO2]	**[8M]**
	b.	Discuss the fracturing methods for development of wells	[L2][CO2]	**[4M]**
9.	**a.**	Explain the back-washing methods for developing wells	[L2][CO2]	**[6M]**
	b.	Write about multiple well systems	[L1][CO2]	**[6M]**
10.	**a.**	Determine the aquifer parameters by using Cooper-Jacob method of solution	[L2][CO2]	**[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	[L2][CO2]	**[3M]**

		'Δs' is 0.40m and 't_o' is 0.39 min		
	c.	Describe Chow's method of solution to determine the aquifer parameters.	[L3][CO2]	**[4M]**

UNIT-III

1.	**a.**	Write short notes on groundwater exploitation and its advantage	[L1][CO3]	**[6M]**
	b.	What are the methods for estimation of groundwater potential	[L4][CO3]	**[6M]**
2.	**a.**	What are the groundwater quality parameters and explain them in brief.	[L1][CO3]	**[8M]**
	b.	Discuss the three-part classification system for the groundwater	[L3][CO3]	**[4M]**
3.	**a.**	Mention the different artificial recharge techniques	[L1][CO3]	**[6M]**
	b.	Explain direct methods of artificial groundwater recharge	[L2][CO3]	**[6M]**
4.	**a.**	What is model? What are the major technical reasons for modeling	[L2][CO3]	**[6M]**
	b.	Classify of Hydrologic/Hydrogeologic Models and explain each of them	[L1][CO3]	**[6M]**
5.	**a.**	Estimate the horse power developed by a windmill having a rotor of 5 m diameter, when the wind speed is 10 km/h. The density of air may be assumed to be 1.293 kg/m^3.	[L1][CO3]	**[4M]**
	b.	Classify the types of indigenous pumps	[L1][CO3]	**[4M]**
	c.	Explain the types of animal operated pumps	[L4][CO3]	**[4M]**
6.	**a.**	Write the Windmill feasibility in water lifting	[L2][CO3]	**[4M]**
	b.	What are the application of windmill	[L1][CO3]	**[2M]**
	c.	Derive equation for power from windmill	[L3][CO3]	**[6M]**
7.	**a.**	What are the types of windmill and explain in brief	[L1][CO3]	**[4M]**
	b.	A windmill is to be designed to develop 0.60 hp at a wind speed of 20 km/h. Determine the diameter of the rotor.	[L2][CO3]	**[4M]**
	c.	Discuss about windmill pumps	[L3][CO3]	**[4M]**
8.	**a.**	Determine the power output of a windmill having a rotor of diameter 5 m, at a wind velocity of 20 km/h on the windward side and 10 km/h on the leeward side. Density of air is 1.293 kg/m^3	[L1][CO3]	**[4M]**
	b.	What are the types of solar powered water pumping system	[L1][CO3]	**[2M]**
	c.	Write advantages, disadvantages and applications of solar powered water lift	[L4] [CO3]	**[6M]**
9.	**a.**	What is biogas? explain the types of biogas plants in brief	[L1][CO3]	**[6M]**
	b.	What are maintenance required for bio gas plants	[L1][CO3]	**[6M]**
10.	**a.**	What is reciprocating pumps and explain its components in brief	[L1][CO3]	**[6M]**
	b.	Explain the types of reciprocating pumps	[L3][CO3]	**[3M]**
	c.	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	[L4] [CO3]	**[3M]**

		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.		

UNIT-IV

1.	**a.**	What are the mechanical principles of water lifting devices	[L1][CO4]	**[6M]**
	b.	Explain about manually operated water lifting devices	[L4][CO4]	**[6M]**
2.	**a.**	Classify the types of pumps	[L1][CO4]	**[5M]**
	b.	What is positive displacement pumps and rotodynamic pumps	[L1][CO4]	**[3M]**
	c.	What are advantages and disadvantages of reciprocating pumps	[L1][CO4]	**[4M]**
3.	**a.**	What is reciprocating pumps and explain its component parts	[L1][CO4]	**[8M]**
	b.	What are the types of reciprocating pumps	[L2][CO4]	**[4M]**
4.		Discuss the performance and adaptability of commonly used indigenous water lifts	[L3][CO4]	**[12M]**
5.	**a.**	Explain about common troubles in operating reciprocating pump and their remedies	[L3][CO4]	**[6M]**
	b.	What are factors must be considered in selection of centrifugal pump	[L2][CO4]	**[6M]**
6.	**a.**	Explain sump installation of centrifugal pump with neat labelled diagram	[L3][CO4]	**[4M]**
	b.	Describe power required for centrifugal pump with expression	[L4][CO4]	**[8M]**
7.		What is centrifugal pump? Explain components of centrifugal pump with neat diagram	[L1][CO4]	**[12M]**
8.	**a.**	Classify centrifugal pump based on their characteristic features	[L1][CO4]	**[8M]**
	b.	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.	[L2][CO4]	**[4M]**
9.	**a.**	Explain suction installation of centrifugal pump with neat sketch	[L3][CO4]	**[6M]**
	b.	Describe the various efficiencies of centrifugal pump with expression	[L3][CO4]	**[6M]**
10.	**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][CO4]	**[3M]**

	b.	Discuss in detail about the trouble shooting of centrifugal pump	[L3][CO4]	**[9M]**

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UNIT-V

1.		Briefly explain the design of centrifugal pump	[L3][CO5]	**[12M]**
2.	**a.**	Define the terminology with expression: water horse power, shaft horse power, break horse power, input horse power	[L1][CO5]	**[4M]**
	b.	Explain performance curve of the pump	[L3][CO5]	**[8M]**
3.	**a.**	State affinity law. Discuss effect of change of pump speed on pump performance and on impeller diameter	[L2][CO5]	**[9M]**
	b.	A centrifugal pump requires 5 kW power when it runs at 1450 rpm and delivers water against a head of 10 m. If the pump is operated at 1750 rpm, calculate the head developed and the power required by the pump.	[L1][CO5]	**[3M]**
4.	**a.**	What is hydraulic ram	[L1][CO5]	**[2M]**
	b.	Discuss the application of hydraulic ram	[L2][CO5]	**[4M]**
	c.	Describe the construction of hydraulic ram	[L3][CO5]	**[6M]**
5.	**a.**	Explain briefly about propeller pump and its Principle of operation	[L3][CO5]	**[6M]**
	b.	Give brief explanation about Performance characteristics of mixed flow pump	[L1][CO5]	**[6M]**
6.	**a.**	State: D'Aubuisson's efficiency ratio and Rankine formula for efficiency of hydraulic ram	[L1][CO5]	**[4M]**
	b.	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 (ii) Rankine's formula.	[L1][CO5]	**[4M]**
	c.	Write a short note on selection of propeller pumps.	[L2][CO5]	**[4M]**
7.		Discuss briefly on repair and maintenance of propeller pump.	[L3][CO5]	**[12M]**
8.	**a.**	What are the advantages and disadvantages of vertical turbine pumps.	[L1][CO5]	**[6M]**
	b.	What is Mixed flow pumps and discuss Principle of operation.	[L1][CO5]	**[6M]**
9.		Write a short note on Submersible pump with neat labeled diagram.	[L4][CO5]	**[12M]**
10.		Briefly discuss the vertical turbine pump with neat schematic diagram.	[L4][CO5]	**[12M]**

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