Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May– 2017**

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| **Code :** | **16CE3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DESIGN OF HYDRAULIC AND CONVEYANCE STRUCTURES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. |  | Design a suitable section for the overflow portion of a concrete gravity dam having the downstream face sloping at a slope of 0.7 H : 1 V. The design discharge for the spillway is 8000 cumecs. The height of the spillway crest is kept at RL 204.0 m. The average river bed level at the site is 100.0 m. The spillway length consists of 6 spans having a clear width of 10 m each. Thickness of each pier may be taken to be 2.5 m. | CO1 | 20 |
| (OR) | | | | |
| 2. | a. | What are the geological consideration for a reservoir site? | CO1 | 15 |
| b. | How the design life of the reservoir is determined? | CO1 | 5 |
| 3. | a. | Check the stability of the foundation of the earthen dam section given in Problem 9(a). | CO2 | 8 |
|  | b. | Check the stability of the foundation of the d/s slope of the earthen dam section given in Problem 9(a), on a possible slip circle. Determine the factor of safety that will be available, if by some how, the soil in the d/s triangular shoulder gets fully submerged. Also compare this net factor of safety with the factor of safety that can be obtained for similar conditions if the analysis was done by shear force determination at the base of the d/s slope. | CO2 | 12 |
| (OR) | | | | |
| 4. |  | Elaborate the basic layout of concrete gravity dam and apparent structures. | CO2 | 20 |
| 5. | a. | Point out in detail the different properties of an aquifer. | CO3 | 5 |
|  | b. | A catchment area of 175km2 received 150cm rainfall in a year. At the outlet of the catchment, the flow in the stream draining the catchment was found to have an average rate of 1.6m3 /s for the first 4 months, 2.0m3 /s for next 5 months and 3.5m3 /s for remaining 3 months (a) What is the runoff coefficient at the catchment? (b) If the afforestation of the catchment reduces the runoff coefficient to 0.30, what is the increase in the abstraction from precipitation due to infiltration, evaporation and transpiration for the same annual rainfall of 175cm? | CO3 | 15 |
| (OR) | | | | |
| 6. | a. | Mention the methods for improving the duty of water | CO3 | 5 |
|  | b. | A 60cm diameter well is being pumped at the rate of 1360 liters/min. Measurements made in the nearby test well at the same time are as follows. At a distance of 6m from the well being pumped, the drawdown was 6m and ay 15m the drawdown was 1.5m. The bottom of the well is 90m below the groundwater table. (a) Find out the coefficient of pearmeability. (b) If all the observed points were on the Dupuit curve, what was the drawdown in the well during pumping? (c) What is the specific capacity of the well (d) At which the water can be drawn from the well? | CO3 | 15 |
| 7. | a. | Discuss and express what you understand by the following terms. (a) Crop Period (b) Base Period (c) Rotation Period (d) Delta (e) Duty of water. | CO3 | 5 |
|  | b. | Find the optimum number of raingauges in a catchment area for a permissible error of 6% and 8%.  (a) Number of existing raingauges = 8  (b) Mean annual rainfall at gauges = 1000, 950, 900, 850, 800, 700, 600, and 400 mm. | CO3 | 15 |
| (OR) | | | | |
| 8. | a. | Compare and contrast between artificial recharge and natural recharge. | CO3 | 5 |
|  | b. | A reservoir has the following areas enclosed by contours at various elevations. Determine the capacity of reservoir between elevations 200.00 and 300.00.  **Elevation Area of contour (km2 )**  200.00 150.00  220.00 175.00  240.00 210.00  260.00 270.00  280.00 320.00  300.00 400.00  Use  (a) Trapezoidal formula  (b) Prismoidal formula | CO3 | 10 |
|  | c. | Elaborate on surplus weir and tank sluice | CO3 | 5 |
|  | | **Compulsory**: |  |  |
| 9. |  | An earthern dam made of homogeneous material has the following data:   |  |  |  | | --- | --- | --- | | Level of the top of the dam | = | 200.0 m | | Level of deepest river bed | = | 178.0 m | | H.F.L of reservoir | = | 197.5 m | | Width of top of dam | = | 4.5 m | | Upstream slope | **=** | 3 : 1 | | Downstream slope | = | 2 : 1 | | Length of the horizontal filter from d/s toe, inwards | = | 25 m | | Cohesion of soil of dam | = | 24 kN/m2 | | Cohesion of soil of foundation | **=** | 54 kN/m2 | | Angle of internal friction of soil in the dam | = | 250 | | Angle of internal friction of soil in the foundation | = | 120 | | Dry weight of soil in the dam | = | 18 kN/m3 | | Submerged weight of soil in the dam | = | 12 kN/m3 | | Dry unit weight of foundation soil | = | 18.3 kN/m3 | | Coefficient of permeability of soil in the dam | = | 5 x 10-6 m/sec |   The foundation soil consists of 8 m thick layer of clay, having negligible coefficient of permeability. Check the stability of the dam. | CO2 | 20 |

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