M.E-(First Semester)-WREM

WRM – I

Register Number: **5903**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(WATER RESOURCES ENGINEERING & MANAGEMENT)

FIRST SEMESTER

WREC–103. SURFACE WATER HYDROLOGY

(Common with Part Time)

November] [Time : 3 Hours

Maximum : 60 Marks

Answer any FIVE questions
Draw sketches wherever necessary

1. a) Discuss the hydrological equations with the aid of examples. (7)

   b) Write in detail about principles of hydrology. (5)

2. a) Explain in detail about atmospheric circulation. (5)

   b) Discuss
   (i) Warm front
   (ii) Cold front
   (iii) Trophical cyclones with the aid of neat sketches. (7)

3. a) Explain the procedure for checking a rainfall data for consistency. (6)

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3. b) For a drainage basin of 600 km^2, iso hyetals drawn for a storm gave the following data. (6)

Iso hyetals (internal) (cm)	15-12	12- 9	9-6	6-3	3-1
Inter-isohyetal area (km^2)	92	128	120	175	85

Estimate the average depth of precipitation over the catchement.

4. a) What is probable maximum precipitation over a basin? How it is estimated? (6)

   b) Explain Maximum depth–Area–Duration curves relating to precipitation over a basin. (6)

5. a) Describe the factors affecting evapotranspiration process. (6)
   b) Describe the methods commonly used for estimating evapotranspiration. (6)

6. a) Explain infiltration indices. (6)
   b) Discuss (i) infiltration capacity (ii) PET (6)

7. a) Describe briefly the estimation of yield of a catchement. (6)
   b) Describe a food hydrograph. Explain any one procedure for separating base flow. (6)

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8. a) A 6-h unit hydrograph for a catchment area of 1000 km^2 can be approximated as a triangle with base of 69 hr. The peak occurs at 20 hr from the start. Derive the coordinates of 6-h distribution graph for this catchement. (8)

   b) Explain (i) S- Curve hydrograph (4)
   (ii) IUH

Register Number: 5901

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(Water Resources Engineering & Management)

(First Semester)

WREC-101. Applied Statistics and Stochastic process

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any five questions
All questions carry equal marks
Statistical tables are permitted to be used

1. a) At a station rainfall were observed for 55 days in a year. The rainfall data are grouped as given below. Find the mean, median and mode of the sample?

Rainfall (cm)	41-50	51-60	61-70	71-80	81-90	91-100	101-110	111-120
Frequency	5	8	10	11	12	4	3	2

(8)

b) Write the relationship among mean, median and mode? What do you mean by skewness? (4)

2. Annual values of ground water table fluctuations, rainfall and depth of water withdrawn from a watershed of 100 sq.km are given. Obtain a regression relation of the form $a+bx_1+cx_2=y$ and find the multiple Co-relation Coefficient?

Storm date	1988	1989	1990	1991	1992	1993	1994	1995	1996
Rainfall (cm)	140	85	103	119	98	150	124	99	68
Depth of water pumped out(cm)	11	13	9	12	8	9	13	12	14
Water table fluctuations	50	32	47	50	60	90	57	52	24

(12)

3. Write notes on the following:

a) Pearson type-III distribution
b) Log Pearson type-III distribution
c) Gamma distribution
d) Log normal distribution (4x3=12)

4. a) If X is a normal variate with mean 30 and standard deviation 5, find the probabilities that

   i) $26 \leq x \leq 40$ ii) $X \geq 45$ and $3|X-30| > 5$

   (3+2+3=8)

   b) What are the features of binomial distribution? When is binomial distribution applicable in water Resources Engineering? (4)

5. Following discharge data are observed at a guaging site. Test the goodness of fit of normal distribution at 5% significance level using Chi-square test?

Discharge m^3/s	500-2000	2000-3500	3500-5000	5000-6500
No.of occurence	18	12	10	5

6500-8000	8000-9500	9500-11000	11000-12500
3	0	2	2

(12)

6.a) The following statistics are obtained from a sample of 150 of a random variable X. mean $\bar{X} = 278$, standard deviation $s_x=25$ Skewness Coefficient $g_1 = -0.023$ and Kurtosis Coefficient $g_2=3.084$. What distribution could be a correct choice to describe the random variable. Give reasons to support it? (8)

   b) Write the applications of 't' distribution. (4)

7. Explain any <u>four</u> of the following:

   a) Scatter diagram
   b) Correlogram
   c) Smoothing of spectrab density function
   d) Limitations of sampling
   e) Ergodic process

   (4x3=12)

8. Assuming an ARMA (1,1) model is a good fit to describe the normally distributed annual flows of a stream whose mean, standard deviation, first and second serial correlation Coefficients are estimated to be 940 Mm^3, 315 Mm^2, 0.56 and 0.44 respectively, generate 3 annual flows. The sequence of 3 standard normal random numbers may be taken as 1.077, 1.027, 0.678.

Register Number: 5905

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(Water Resource Engineering & Management)

(First Semester)

WREE-105. Water Resources Planning

(Elective)

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any five questions

1. List the steps involved in the process of planning of water resources project. (12 Marks)

2. Identify some specific water resources systems planning problems and for each problem, specify in words, the possible objectives, the unknown decision variables whose values need to be determined, and the constraints that must be met by any solution (12 Marks)

3. Distinguish between multi purposes and multi objectives and give some examples of complementary and conflicting purposes and objectives of water resources projects. (12 Marks)

4. What is benefit-cost ratio? What is its role in evaluating alternative water resources proposals? (12 Marks)

5. What are the different types of data required for planning water resources projects? Discuss about the relevance of demographic data and socio-economic data in drinking water supply planning for a city. (12 Marks)

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6. What are the primary and secondary data to be collected and analysed for a proposal on supplying drinking water to a town of population of about 1,00,000? Discuss how the errors in these data will affect the project. (12 Marks)

7. It is proposed to provide drinking water for a population of 4000 people of a village. The sources of water are groundwater and an irrigation tank. Groundwater is available in all periods of a year at reasonable depths while surface tank water is not normally available for 3 months in a year. Further, the tank depends purely on rainfall for its inflow. Fish harvesting from the tank yields some economic benefit to the village community. At the end of the crop season, for easy fish harvesting, the tank is being drained. During the cultivation periods, the groundwater quality is slightly affected by the leaching of fertilizers and pesticides applied on the fields. Discuss the various planning processes to be followed, data to be collected, questionnaire surveys to be conducted, and alternative to be considered for this project. (12 Marks)

8. What is meant by post analysis and explain the importance of post analysis? (12)

Register Number: **3523**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2008

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-103.SURFACE WATER HYDROLOGY

(Common with part time)

Nov) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL questions
Draw sketches wherever necessary
All questions carry equal marks

1. a) What are the engineering applications of Hydrological Equations?

   b) Draw the hydrological cycle sketch with their Components.

2. a) Discuss about the zones of atmosphere related with Temperature.

   b) How the cyclones are forming during Monsoon Season?

3. a) What are the methods used to estimate the depth of rainfall over a large Catchment Area?

   b) Which is called as maximum probable Rainfall?

4. a) Describe the frequency analysis of Precipitation Data.
   b) Explain maximum depth-area-duration curve.

5. a) What do you mean by Infiltration Index?

   b) A Storm with 20cm of Precipitation produced a surface runoff of 11-6Cm. Estimate φ-index of the if the data recorded is as follows.

Storm time(h)	1	2	3	4	5	6	7	8
Incremental Rainfall per hour(Cm)	0.8	1.8	3.0	4.6	3.6	3.2	2.0	1.0

6. Enumerate the components of evapo transpiration losses. Describe the significance and contribution of each component to the process.

7. Describe the factors affecting runoff. Describe the methodology for computation of flow discharge in a River.

8. What is a synthetic unit Hydrograph? Describe the basic principles on which the method for deriving such a hydrograph is based.

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4. Given below are the flood records for 15 years at Bhakra Dam site on Sutlej River. Determine by any frequency method:
   i) The 50-year, 100-year and 200-year floods.
   ii) The flood magnitude having a 1% chance of occurrence in any one year
   iii) The recurrence interval of flood peaks of 6000 and 12000 cumec

Year	Flood peak (cumec)	Year	Flood peak (cumec)
1937	3110	1945	2380
1938	5800	1946	3810
1939	3090	1947	7800
1940	1723	1948	4525
1941	3630	1949	3250
1942	6600	1950	4980
1943	5260	1951	9200
1944	2290		

5. a) The sample mean and variance of a river data are calculated as $\overline{X}$=67,500 and S_x=21,000. What are the 95% confidence limits on the mean assuming the sample is from a normal population. The number of samples is n=66. Use the t-distribution.

   b) Assume a single observation is selected from a normal distribution with mean μ_1=7 and variance σ^2_0=9. It is hypothesized that $\mu=\mu_0$=5. If the test is conducted at the 10% significance level, what is the probability of Type II error?

6. What is Multiple regression? Discuss in detail the principles involved in fitting a multiple linear regression.

7. Discuss the following tests of hypotheses:
   i) Test $H_0:\sigma^2=\sigma^2_0$ versus H_a: $\sigma^2\neq\sigma^2_0$ Normal population
   ii) Test of $H_0:\sigma^2_1=\sigma^2_2$ versus H_a: $\sigma^2_1\neq\sigma^2_2$ for Two Normal Populations
   iii) Test for Differences in Means of Two Normal Distributions

8. Write short notes on any THREE of the following:
   a) Correlogram
   b) First –order AR process
   c) Moving Average Filtering
   d) Cross-correlation analysis
   e) ANOVA

Register Number: **8331**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-101. APPLIED STATISTICS AND STOCHASTIC PROCESS.

(Common with Part-Time)

May) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL questions
Assume required data wherever necessary

UNIT-I

1. Calculate the mean, standard deviation, coefficient of variation, skewness coefficient and kurtosis from the following river discharge data recorded in m^3/Sec.

56,	58,	84,	92,	112,	126,	131,	160,
170,	186,	192,	195,	197,	231,	250,	257,
263,	273,	276,	281,	290,	296,	300,	320,
350,	264,	380,	420,	425,	435,	455,	458,
320,	350,	264,	380,	420,	425,	435,	455,
458,	490,	560,	570,	576,	665,	680,	700,

(12)

2. Write short notes on the following.
   a) Principles of least squares
   b) Curve linear correlation
   c) Coefficient of determination (12)

3. How will you derive the standard error of estimate for a regression line? (12)

4. Discus the types of correlations used in Hydrology. Give examples for each with neat sketches. (12)

5. What is the probability that a 5 year flood will not occur at all in 20 years and it will occurrence in 25 years? (12)

6. Describe binomial distribution with sketches for negative skewness coefficient, zero skewness coefficient and positive skewness coefficient. (12)

7. Describe the spectrum of a moving arrange process and spectrum of an auto regressive process. (12)

8. Explain the first order AR process and second order AR process, with sketches. (12)

Register Number: **3601**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-101. APPLIED STATISTICS AND STOCHASTIC PROCESS

(OLD REGULATION)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions
Assume required data wherever necessary
All questions carry equal marks

1. a) Write short notes on
(i) Objectives of classification and
(ii) Types of classification.

   b) If the arithmetic mean of two numbers is 20 and geometric mean is 16, what is their harmonic mean?

2. a) A group of 5 students took tests before and after training and obtained the following scores.
Before training: 3 4 4 6 8
After training: 4 5 6 8 10
Find by the method of least squares the straight line of best fit.

   b) Find the correlation coefficient between heights of father and heights of son for the following data:

Heights of father (in inches)	60	62	63	65	66	68	70
Heights of son (in inches)	61	63	64	65	65	70	71

3. a) Fit a polynomial of the second degree for y in terms of x to the following data:

X	1	3	5	7	9
Y	3	10	36	77	150

   b) Distinguish between correlation and regression.

4. a) If from a pack of cards a single card is drawn, what is the probability that it is either a spade or a king?

   b) The mean and variance of a bionomial distribution are 4 and 4/3. Find $P(X \geq 1)$.

5. a) List the chief properties of normal distribution and indicate its importance in statistical theory.

   b) State the distinctive features of the bionomial, poisson and normal distribution.

6. a) Distinguish between
i) Null and Alternate Hypothesis
ii) Type I and Type II errors

   b) Tests made on the breaking strength of 10 pieces of a metal gave the following results: 578, 572, 570, 568, 572, 570, 570, 572, 596 and 584 kg. Test if the mean breaking strength of the wire can be assumed as 577kg. Given $t_{0.05} = 2.26$.

7. Explain briefly the two-terms sampling distribution of a statistic and standard error of a statistic.

8. a) When is a random process said to be ergodic? Give an example for an ergodic process.

   b) Explain discrete and continuous spectrum.

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7. Discuss the following tests of hypotheses:
   i) Test $H_0:\sigma^2=\sigma^2_0$ versus $H_a: \sigma^2\neq\sigma^2_0$ Normal population
   ii) Test of $H_0:\sigma^2_1=\sigma^2_2$ versus $H_a: \sigma^2_1\neq\sigma^2_2$ for Two Normal Populations
   iii) Test for Differences in Means of Two Normal Distributions

8. Write short notes on any THREE of the following:
   a) Correlogram
   b) First –order AR process
   c) Moving Average Filtering
   d) Cross-correlation analysis
   e) ANOVA

Register Number: **3601-A**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-101. STATISTICAL METHODS IN HYDROLOGY AND WATER RESOURCES ENGINEERING

(For those admitted during 2009-2010 and after)

(Common to M.E. (Part Time) First Semester)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE full Questions
Each full question carries 12 marks
Use of Statistical Tables is permitted

1. The number of rainy days in the first week of July at a particular rain gauge station for a period of 50 years is recorded as given below:

No. of Rainy days	0	1	2	3	4	5	6	7
No. of years of occurrence	2	9	15	13	7	3	1	0

Assuming that the binomial distribution can be used to model this event, estimate the parameter p. Test the goodness of fit of the binomial distribution at 5% significance level by chi-square test.

The critical value of χ^2_0 for various degrees of freedom and different levels of significance are given below:

Degrees of freedom	Level of significance	
	0.10	0.05
5	9.24	11.07
6	10.64	12.59
7	12.02	14.07
8	13.36	15.51

2. The concurrent average annual rainfall and the corresponding runoff of a watershed in millimeters for a period of 17 years are given below. Establish the dependence between rainfall and runoff by way of correlation coefficient between them. Also, obtain the regression line to predict the annual runoff based on the known values of annual rainfall from the data.

i	Rainfall x_i	Rainoff y_i	i	Rainfall x_i	Rainoff y_i
1	113	74	10	119	78
2	128	104	11	152	109
3	127	96	12	137	96
4	104	61	13	165	124
5	108	59	14	151	103
6	115	82	15	160	134
7	167	109	16	130	87
8	154	102	17	149	106
9	99	57			

3. Differentiate between the following citing examples:
   i) Deterministic process and stochastic process
   ii) Discrete state stochastic process and Continuous state stochastic process
   iii) First- order stationary process and Second-order stationary process

4. Given below are the flood records for 15 years at Bhakra Dam site on Sutlej River. Determine by any frequency method:
   i) The 50-year, 100-year and 200-year floods.
   ii) The flood magnitude having a 1% chance of occurrence in any one year
   iii) The recurrence interval of flood peaks of 6000 and 12000 cumec

Year	Flood peak (cumec)	Year	Flood peak (cumec)
1937	3110	1945	2380
1938	5800	1946	3810
1939	3090	1947	7800
1940	1723	1948	4525
1941	3630	1949	3250
1942	6600	1950	4980
1943	5260	1951	9200
1944	2290		

5. a) The sample mean and variance of a river data are calculated as $\overline{X}$=67,500 and S_x=21,000. What are the 95% confidence limits on the mean assuming the sample is from a normal population. The number of samples is n=66. Use the t-distribution.

   b) Assume a single observation is selected from a normal distribution with mean μ_1=7 and variance σ^2_0=9. It is hypothesized that $\mu=\mu_0$=5. If the test is conducted at the 10% significance level, what is the probability of Type II error?

6. What is Multiple regression? Discuss in detail the principles involved in fitting a multiple linear regression.

Register Number: **3602-A**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-102. OPEN CHANNEL HYDRAULICS

(New Regulation)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions

1. Derive the dynamic equation for gradually varied flow stating the assumptions made.

2. Write a detailed note on classification of flow profiles.

3. An overflow spillway is to be designed to pass a discharge of 2000 m^3/sec of flood flow at an upstream water surface elevation of 200m. The crest length is 75.0m and the elevation of average stream bed is 165.0m. Determine the design head and profile of spillway.

4. Describe any one method to compute flow profile of spatially varied flow.

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5. Derive the dynamic equation for unsteady gradually varied flow.

6. Describe in detail the design of regime channels.

7. Describe the various factors to be taken into account for the design of physical models.

8. Write shorts notes on any THREE of the following:
   a) Pressure distribution in open channels
   b) Step by step method
   c) Moving hydraulic jump
   d) Sediment transport
   e) Dimensional analysis.

Register Number: **3603-A**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-103. SURFACE WATER HYDROLOGY

(New Regulation)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions

1. Describe Reynolds transport theorem ad how it is used to develop continuity equation.

2. Calculate the precipitable water in a saturated air column 10km high above $1m^2$ of ground surface. The surface pressure is 101.3kPa, the surface air temperature is 30°C and the lapse rate is 6.5°C/km.

3. Explain in detail Horton's equation and Phillip's equation of finding the infiltration.

4. Explain SCS method for computing abstractions from storm rain fall.

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5. What is a unit hydrograph? What are the assumptions made in the derivation of unit hydrograph? What are its applications? Explain

6. Explain Hydrologic river routing.

7. Explain the methods for calculating probable maximum precipitation.

8. Write shorts notes on any three of the following:
   a) Intensity –duration –frequency relationship
   b) Saint-Venant's equations
   c) Effective rain fall
   d) Penman's method
   e) Isohyets.

Register Number: **3604**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-104. GROUND WATER HYDROLOGY

(COMMON WITH PART-TIME)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions
Assume required data wherever necessary

1. Describe the zoning of subsurface with a neat sketch. Classify the subsurface water and explain their behaviour with sketches. (12)

2. Write short notes on the following:
   i) Specific yield
   ii) Storativity
   iii) Coefficient of Transmissibility
   iv) Flow net under a dam section (12)

3. A tracer took 18hr to travel from a well A to B 150m away from it. Map of the water table contour shows a difference of 0.8m in their water table elevations. The aquifer is made up of mixed sand with porosity of 35% Calculate (i) Coefficient of permeability (ii) intrinsic permeability and (iii) Reynold's numbers if mean particle size of the medium is 1mm; kinematic viscosity is 0.0114 cm^2/sec. (12)

4. Derive the discharge equation for a steady radial flow into a well in unconfined aquifer. List out the assumptions followed. (12)

5. Total thickness of a confined aquifer is 20m and it is assumed that the well penetrates into the full depth of the aquifer. Calculate the coefficient of transmissibility for discharge of 1.5 m^3/min. $h_1=58.0$ at $r_1=120m$ and $h_2=58.9m$ at $r_2=160m$. Take well diameter =30cm. (12)

6. At an infiltration gallery of 200m long, observed K=40m/day, influence of drawdown of the gallery is 300m, height of zero influence from a common datum is 10m, drawdown at the gallery is 7m. Obtain (i) total flow into the gallery and (ii) equation of phreatic line and the location of ground water table at 50m from the gallery. (12)

7. Write short notes on the following:
   i) Well completion ii) Well development
   iii) Horizontal infiltration gallery. (12)

8. What the factors influencing the ground water fluctuations? What will be the effect of overdraft of groundwater? (12)

Register Number: **3605**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREC-105. WATER RESOURCES PLANNING

(Common with Part-Time)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions
Draw sketches wherever necessary
All questions carry equal marks

1. a) Describe the steps to be followed in the planning process.

   b) Discuss about the recent trends in reservoir planning.

2. a) How will you formulate the objects for a regional welfare project?

   b) What are the types of data required for a project proposal?

3. a) What are the steps followed in administration for planning of a construction work?

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3. b) Discuss about the milestone chart and its uses.

4. a) Enumerate the data required for water resources project planning.

   b) What is the procedure followed for data management?

5. a) Discuss about socio-economic objectives and the data required for that.

   b) Explain the social benefit cost analysis

6. a) What is known as technological assessment and evaluation of alternatives?

   b) Discuss about Environmental and Ecological appraisal.

7. Describe the technological alternatives for water resources development in a multipurpose reservoir.

8. a) What is known as Post analysis?

   b) Explain the importance of Post analysis with a case study?

Register Number: **3606**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2009

(WATER RESOURCES ENGINEERING & MANAGEMENT)

(FIRST SEMESTER)

WREE-106. SOIL AND WATER CONSERVATION ENGINEERING

(Common with Part-Time)

(Elective)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL Questions
Draw the sketches wherever necessary
All questions carry equal marks

1. a) Explain the types of soil erosion

   b) Discuss about geologic erosion.

2. The data of a rainfall is given below. Determine the rainfall erosivity factor(R) for the given storm.

Time increments (min)	0	15	30	45	60	75	90	105	120	135	150
Mass curve ordinate (cm)	0	0.3	0.8	1.5	2.5	4.0	5.2	6.0	6.6	7.0	7.0

3. a) Describe the erosions caused by runoff.

   b) Discuss about the land slides.

4. a) How will you estimate the wind erosion losses?

   b) How will you control the wind erosion?

5. a) Explain the soil conservation structures and their functions.

   b) Discuss about chutes and flumes.

6. a) What are the methods of downstream flood control?

   b) What are the design steps for subsurface drainage?

7. a) Describe the procedure for design of grassed waterways.

   b) Discuss about the artificial recharge.

8. Write short notes on the following:
   a) Salt balance in soil
   b) Control of seepage
   c) Land grading
   d) Terrace construction

Register Number: **3716**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2010

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-103. SURFACE WATER HYDROLOGY

(New Regulation)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE Questions **(5×12=60)**

1. How is precipitation measured? Discuss the three methods which convert the point precipitation to areal precipitation and comment on the best method.

2. A catchment of $30km^2$ has one recording gauge. During a storm the mass curve of rainfall was recorded. If the volume of surface runoff measured as $1.2Mm^3$.

Time (hr)	0	2	4	6	8	10	12	14
Cum. Rainfall (mm)	0	6	17	57	70	81	87	90

Estimate depth of runoff, ϕ index, draw the hyetograph and total precipitation.

3. Find out monthly evaporation loss both in terms of depth and volume from a canal having base width 30m and depth of flow 2.5m. The length of canal is 5km. The pan initially filled up with water to a depth of 8cm. During the period observation a rainfall of 3cm was recorded. To keep the water level same in the pan, 2cm depth had to be removed. At the end of period of observation the depth of water in the pan was found to be 8.5cm, if pan used is class A(C_p=0.7).

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4. An infiltrometer test on a ring with 35cm diameter yield the following data:

Time from start of the expt.(min)	0	2	5	10	20	30	60	90	150	210
Volume water added since start (cm^3)	0	278	658	1173	1924	2500	3345	3875	4595	5315

Determinant the infiltration capacity for the time intervals in the experiment. What is the ultimate infiltration capacity, f_c? What is the average infiltration capacity for the first 10 minutes and for the first 30 minutes of the experiment?

5. Derive the ordinates of 12hr unit Hydrograph with the help of given 4 hr unit Hydrograph and draw the unit Hydrograph.

Time:	0	4	8	12	16	20	24	28	32	36	40	44
UHO	0	20	75	125	150	125	90	50	25	15	5	0

6. How is Gumble's method used to determine the annual peak flood discharge?

7. Between two reaches A and B of a river, the values of Muskingum coefficients determined are K=24hr and X=0.2. Find and plot the outflow hydrograph.

Time(hr)	12	24	36	48	60	72	84	96	108	120	132	144	156	168
Inflow (m^3/sec)	14	22	36	93	141	102	86	73	61	50	38	26	20	16

8. Write short notes on any three of the following:
   a) Probable Maximum Percipitation
   b) Maximum Probable flood
   c) Complex storm
   d) Intensity Duration Frequency(IDF)
   e) Reservoir routing and channel routing.

Register Number: **3717**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2010

(WATER RESOURCES ENGINEERING AND MAINTENANCE)
(FIRST SEMESTER)

WREC-104. GROUNDWATER HYDROLOGY
(New Regulation)

Nov) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE questions (5×12=60))

1. Explain the following:
   a) Historical background of groundwater hydrology. (4)
   b) Groundwater age of groundwater. (4)
   c) Origin and age of ground water. (4)

2. Explain the following:
   a) Specific yield. (4)
   b) Storage coefficient. (4)
   c) Springs (4)

3. Describe Daray's law are its variety and also explain the intrinsic permeability. (12)

4. Explain the following:
   a) Flow across a hydraulic conductivity boundary. (6)
   b) General flow equations in rectangular and radial co-ordinations. (6)

5. Explain unsteady radial flow in a confined aquifer and describe the methods with example. (12)

6. Describe the methods for constructing deep wells. (12)

7. Explain the following:
   a) Well completion. (4)
   b) Pumping equipment (4)
   c) Horizontal wells (4)

8. Explain the fluctuations due to evapotranspiraiton and meteorological phenomenon. (12)

Register Number: **3718**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2010

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-105. WATER SHED MANAGEMENT FOR SUSTAINABLE DEVELOPMENT

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE Questions **(5×12=60)**

1. a) Describe the objectives of watershed Management.

   b) What are the factors influencing watershed development?

2. Describe the main sources of pollution of stream water. What are the control measures?

3. Explain different types of water storage structures and methods of improving water yield from catchment area.

4. How will you develop the groundwater recharge zones and what are the methods for groundwater recharge?

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5. a) Describe the methods available to encourage people's participation in watershed management.

   b) Discuss about identification and evaluations of watershed problems.

6. a) What do you mean by sustainable agriculture?

   b) Explain the advantages of sprinkler irrigation and drip irrigation.

7. a) List the steps to be followed for improved water distribution.

   b) How farmers can help to irrigation management?

8. Write short notes on the following:

   a) Water users association

   b) Terracing

   c) Nutrient cycle in vegetated watershed

   d) Chemicals on watersheds

Register Number: **3719**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2010

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREE-106. SOIL MANAGEMENT AND WATER MANAGEMENT

(Elective)

November] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE Questions **(5×12=60)**

1. Write about physical properties of soil and their significance in soil classification and suitability for agriculture.

2. Discuss about source of organic matter and its effect on soil properties and plant growth. Also, add a note on factors affecting organic water levels in soils.

3. Describe various methods used in measuring soil water content and soil water potential.

4. Enlist major types of soils present in India. Also, explain in detail various aspects of management of degraded / problem soils.

5. a) Write about advantages and methods of seed treatment.

   b) Discuss briefly various types of nursery practices followed in India.

6. What are micro and macro nutrients and discuss in detail the integrated nutrient management.

7. Discuss about the concept of integrated pest management.

8. Write short notes on any THREE of the following:

   a) Growth stages of crops.

   b) Reclamation of acidic, alkaline and salt affected soils.

   c) Types of soil water

   d) Water quality requirement for irrigation.

Register Number: **9223**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2011

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

(Common with Part-Time First Semester)

WREC-103.SURFACE WATER HYDROLOGY

May) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE questions

All questions carry equal marks

1. Describe Hydrologic cycle with a neat sketch. (12)

2. For a drainage basin of 600km^2 , isohyetals drawn for a storm gave the following data.

Isohyetals (interval)(cm)	15-12	12-9	9-6	6-3	3-1
Inter –Isohyetals area(km^2)	92	128	120	175	85

Estimate the average depth of the precipitation. (12)

3. The maximum values of one day rainfall, in cm, during each year for a site for a period of 25 years as follows:
55,90,140,130,95,,85,125,115,65,35,25,40,110,100,
80,45,105,135,145,120,75,30,70,50 and 60
Compute
i) the maximum rainfall values that occur with the recurrence interval of 15 and 5 years
ii) 75% dependable rainfall
iii) recurrence interval for 93 cm rainfall

4. a) The observed hydrograph ordinates for a catchment area given below:

Time hr	0	3	6	9	12	15	18	21	24
24	100	200	1200	1800	1600	1000	400	100	100

Catchment area is 900km^2. Precipitation data area are given below:

Time hr	0-3	3-6	6-9
Rainfall intensity (mm/hr)	16	22	12

Compute (i) ϕ index, (ii) Effective Rainfall Hyetograph and iii) Direct Runoff hydrograph (12)

5. Discuss briefly about the various methods of Evaporation measurements. (12)

6. The ordinates of 2 hr Unit Hydrograph are as follows:

Time hr	0	2	4	6	8	10	12	14	16	18
UHO(Cumec)	0	12	54	126	112	94	64	36	14	0

Determine the area of catchment, storm hydrograph ordinates where effective rainfall in the first 2 hour is 2cm/hr. In the second 2 hour is 4cm/hr and third 2 hour is 1cm/hr.Assume base flow as 20 cumec. Draw the storm hydrograph. (12)

7. Route the following flood through a river reach for which the Muskingum coefficients K and X are 22hr and 0.25 respectively. At t=0, the outflow discharge is 40 Cumec.

Time (hr)	0	12	24	36	48	60	72
Inflow(cumec)	40	65	165	250	240	205	170

Calculate the time and attenuation and draw the hydrograph.

8. Write short notes any three of the following (3×4=12)
a) Cloud Seeding
b)Unit hydrograph
c)"S" Curve hydrograph
d) Synethetic unit hydrograph
e)Instantaneous unit hydrograph

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Register Number: 10281593 . **3715**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2011

(WATER RESOURCE MANAGEMENT / ENVIRONMENTAL ENGINEERING)

(FIRST SEMESTER)

WREC-204/ENVC-105. PIPE LINE ENGINEERING

Nov.] [Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE Questions
All questions carry equal marks

1. a) Establish an expression for flow correction factor in pipes networks analysis by Hardy- cross method. (8)
   b) State the Hazen William formula for flow of water through pipe. (4)

2. a) Differentiate between water tower and clear water reservoirs. Sketch them showing all the appurtenances details. (4)
   b) Calculate the diameter of a pipe required to carry water from a well which is 2414m away from the town. The yield from the source is 1350 litres per minute. The reduced level of the town is 1534m and that of source is 1600m. (8)

3. a) What are the factor to be considered for locating and design of an intake for water supply to a large town from perennial River as a source? (8)
   b) A town s receiving its water supply from a reservoir through 90 cm diameter pipe with a gradient of 1 in 1000. Due to the growth of population it is proposed to increase the supply by 50% laying a part of length an additional 150cm diameter pipe and the new line being cross connected. Find out the length of new pipe and assume friction factor f =0.01. (4)

4. a) Write short note on water demand pattern. (4)
   b) A pipe network consists of the following pipes

Pipe	Length (m)	Diameter (cm)	Friction factor
AB	400	30	0.014
BC	600	30	0.010
AD	500	40	0.012
DC	500	25	0.011

(8)

Inflow at A is 1 m^3/sec, while outflows at B, C and D are 0.3, 0.5 and 0.2 m^3/sec respectively. Find the flow in each pipe taking only one trail. The pressure at A is 100m of water. Verify the result by Newton-Raphson method.

5. a) Define and explain the terms (i) Hydraulic gradient line (ii) Total energy line. (4)

b) State various methods of detection and prevention of wastage. Enumerate the causes of such wastage. (8)

6. a) Discuss the effect of pH on efficiency of chlorination. (4)

b) It is required to treat 3.5 mld of water with 0.3 mg/l of chlorine. If the disinfection is in the form of bleach that contain 30% of available chlorine, how many kg of bleach are needed to treat the daily flow of water. (8)

7. a) Write short note on 'Node—Pipe Connectivity'. (4)

b) Write a source code (computer program code) for the analysis of Multi- input source water distribution pipe network system. (8)

8. Write short notes on any three of the following: (3×4=12)

a. Function of service reservoir
b. Fire hydrants
c. Stand Pipes
d. Metering in distribution system
e. River intake

Register Number: 3401 ~~9222~~

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2011

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST YEAR)

WREC-102.OPEN CHANNEL HYDRAULICS

Nov ~~May~~

(Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE questions
All questions carry equal marks

1. a) Define uniform flow in open channel and Write Chezy's equation (4)

   b) A rectangular channel 25m wide has a specific energy of 1.5m when carrying a discharge of 6.48m^3/sec. Calculate the alternate depths and corresponding Froude numbers. (8)

2. a) Define draw down curve and back water curve. (4)

   b) How surface profiles of gradually varied flow are classified and explain them with sketches. (8)

3. a) How will you distinguish between a gradually varied flow and a rapidly varied flow? (4)

   b) A rectangular channel 10m wide at a slope 1 in 10000 carries a discharge of 30m^3/sec The Manning's n = 0.015. The normal and critical depths are 2.97m and 0.970m respectively. Find the length of water surface profile from the depth of 1.4m to 2.0 m in 3 steps. (8)

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4. a) Sketch the different types of hydraulic jump and explain it (4)

   b) A rectangular channel of 3.0 m wide carries a discharge of 30 m^3/sec Determine whether hydraulic jump may occur at an initial depth of 0.5m or not. If the jump occurs determine the sequent depth. (8)

5. a) A sluice gate discharges 2.5 m^3/sec into a wide horizontal rectangular channel. The depth at the vena contracta is 0.2m. The tail water depth is 2.Om. Assuming the channel to have a Manning's N = 0.015, determine the location of the hydraulic Jump. (4)

   b) Show that the loss of energy in a hydraulic jump $\Delta E = (y_2 - y_1)^3 / (4 y_1 y_2)$ where 'y_1'and 'y_2' are the conjugate depths. (8)

6. a) Define trap efficiency. (4)

   b) A wide alluvial channel has a bed material of median size 0.8mm. The channel has a longitudinal slope of 1/2000. The depth and velocity in the channel were measured as 1.6m and 0.9m^3/sec respectively. Estimate
   (i) Bed load
   (ii) Total load
   (iii) Suspended load per metre width of this channel. (8)

7. a) Describe Reynold's Model law (4)

   b) In the model test of a spillway the discharge and velocity of flow over the model were 2 m^3/sec and 1.5m/sec respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size. (8)

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8. Write short notes any three of the following (3x4=12)
   a. Steady flow and unsteady flow
   b. Critical depth and Normal depth
   c. Specific force
   d. Flow regimes
   e. Capacity Inflow Ratio

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Register Number:

Name of the Candidate:

3400

M.E. DEGREE EXAMINATION, 2014

(WATER RESOURCES ENGINEERING MANAGEMENT)

(FIRST SEMESTER)

WREC-101. STATISTICAL METHODS IN HYDROLOGY AND WATER RESOURCES ENGINEERING

(Common with Part-Time I Semester)

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions **(5 × 15= 75)**

1. For two catchment, the following runoff data were obtained at the outlet. (15)

X_A(mm)	13.26	30.31	15.17	15.5	14.22	21.2	7.7	17.64	22.91	18.89
X_B(mm)	16.97	11.20	20.39	22.06	17.55	23.58	10.63	22.91	21.01	21.01
X_A(mm)	12.82	11.58	15.17	10.4	18.02	16.25	9.93	11.94	14.58	16.85
X_B(mm)	17.0	14.68	14.57	16.67	16.91	14.09	10.63	12.64	15.28	17.55
X_A(mm)	20.59	17.7	12.68	11.2	13.92	8.05	7.44	16.83	6.17	22.51
X_B(mm)	21.29	20.4	15.32	13.9	16.62	10.75	10.14	19.53	8.87	25.21

   (i) Develop a simple linear rainfall-runoff model.

   (ii) Estimate the goodness of fit criteria for the model developed in terms of coefficient of determination (r^2), coefficient of correlation (r), efficiency (EFF), standard error(s)

2. Calculate the mean, standard deviation, coefficient of variation, Skewness coefficient and Kurtosis from the following river discharge data unit m^3/sec. (15)
   56, 58, 84, 92, 112, 126, 136, 160, 170, 186, 192, 195, 197, 231, 250, 257, 263, 273, 276, 281, 290, 296, 300, 320, 350, 264, 380, 420, 425, 435, 455, 458, 490, 560, 570, 576, 665, 680, 700

3. Discuss the different types of correlation used in hydrology. Mention examples for each. (15)

4. A linear relation of the form y=a+bx in to be fitted to the sample of 'n' values. Determine theoretically the parameters a and b by method of least squares. (15)

5. Explain how the method of moment is used to determine the characteristics of hydrologic data? How the sample characteristics are calculated? (15)

6. The annual rainfall at certain place is normally distributed with mean 30. If the rainfalls during the past 8 years are, 31.1, 30.7, 24.3, 28.1, 27.9, 32.2, 25.4 and 29.1 can we conclude that average rainfall during the period of 8 years in less than the normal rainfall? (15)

7. Explain in detail the standard error of estimate for a set of given data. (15)

8. Write short notes on any three of the following: (3×5=15)

   a) Test of Hypothesis

   b) Test for inequality distribution

   c) Kurtosis

   d) Bivariate linear regression

   e) Multiple comparism in ANOVA test

Register Number:

Name of the Candidate:

3401

M.E. DEGREE EXAMINATION, 2014

(WATER RESOURCES ENGINEERING MANAGEMENT)

(FIRST SEMESTER)

WREC-102. OPEN CHANNEL HYDRAULICS

(Common with Part-Time first semester)

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions **(5 × 15= 75)**

1. a) Draw a specific energy curve and explain it. (7)

   b) A trapezoidal channel has a bottom width 6m and side slopes 2 horizontal to 1 vertical. If the depth of flow is 1.2m at a discharge of $10m^3$/sec. Compute the specific energy and critical depth. (8)

2. a) What are the classifications of channel bottom slopes? (7)

   b) Derive the dynamic equation for GVF with any two basic assumptions. (8)

3. a) Define specific force in open channel. (7)

   b) A rectangular flume 2m wide carries a discharge of $2m^3$/ sec. The bed slope of the flume is 0.0004. At a certain section the depth of flow is 1m. Calculate the distance of the selection downstream where the depth of flow is 0.9m. Solve by single step method. Assume rugosity coefficient as 0.014. (8)

4. a) What is the condition for getting hydraulic jump in open channel? (7)

   b) By applying the momentum equation to channel flow, show that the sequent depth and flow rate are related by $\frac{2q^2}{g} = y_1 y_2 (y_1 \pm y_2)$ and also state the assumption made in the derivation. (8)

5. a) What is spatially varied flow? Give an example. (7)

   b) A spillway discharges a flood flow at a rate of $7.75m^3$/sec per metre width. At the downstream horizontal apron, the depth of flow was found to be 0.5m. What tail water depth is needed to form a hydraulic jump? If jump is formed, find its (i) type, (ii) length, (iii) head loss, (iv) energy loss as a percentage of the initial energy. (8)

6. a) Define capacity inflow ratio. (7)

   b) In a wide alluvial stream a suspended load sample taken a height of 0.3 m above the bed indicated a concentration of 1000ppm of sediment by weight. The stream is 5m deep and has a bed slope of 1/4000. The bed material can be assumed to be of uniform size with a full velocity of 2cm/sec. Estimate the concentration of sediment at mid span. (8)

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7. a) Define Renold's number and Froud's number. (7)

   b) In 1 in 40 model of a spillway, the velocity and discharge are 2m/sec and $2.5m^3$/sec. Find the corresponding velocity and discharge in the prototype. (8)

8. Write short notes on any three of the following: (3×5=15)

   a) Velocity distribution

   b) Alternate depth

   c) Flow regimes

   d) Control section

   e) Trap efficiency

Register Number: **0602**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCE ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC – 103. SURFACE WATER HYDROLOGY

(Common with Part Time)

May] [Time: 3 Hours

Maximum: 75 Marks

Answer any FIVE questions **(5 × 15 = 75)**

1. a) Describe the various classification of hydrologic models. (7)

   b) Brief the following terms. (4 × 2 = 8)

   (i) Air Front

   (ii) Anti cyclone

   (iii)Maritime air mass

   (iv)Water vapour.

2. a) Discuss the various forms of precipitation. (7½)

   b) Describe briefly the Weighing-Bucket raingauge with a neat sketch. (7½)

3. A strom commenced at 7.00 hours. The ordinates of the rainfall mass curve of this strom in MM as recorded by a recording raingauge at 15 minutes intervals are 0, 9.5, 17.0, 27.0, 40.5, 49.0, 63.0, 84.0, 95.0, 102.0, 110.0, 112.0 and 112.0. Construct a hyetograph of this strom for a uniform interval of 15 minutes. (15)

4. Discuss briefly the water budget method and lysimeter methods adopted in the measurement of evopotranspiration. (15)

5. a) Describe with neat sketch the tube, doubling infibrometers. (8)

   b) The total observed run off volume during a 6 hour strom with a uniform intensity of 1.50 CM/h is 21.6×10^6 M^3. If the area of the basin is 300 KM^2, Find the average infiltration rates for the basin. (8)

6. Explain the various methods of measuring the discharge in a stream along with their advantages and disadvantages. (15)

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7. a) Give the uses and applications of unit hydrograph. (7)

   b) A peak ordinate of a flood hydrograph produced by a 4 hour strom yielding 6.70 cm rainfall is observed to be 8.32 M^3/sec. If the base flow and ϕ index are 15 M^3/sec, and 0.50M/h, what is the peak ordinate of a 4 hour unit hydrograph? (8)

8. Write short notes on the following: (3 × 5 = 15)

   (i) Flow marking

   (ii) Cloud feeding

   (iii) Isohyets.

Register Number: **0600**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2015

WATER RESOURCES ENGINEERING AND MANAGEMENT

(FIRST SEMESTER)

WREC-101.STATISTICAL METHODS IN HYDROLOGY AND WATER RESOURCES ENGINEERING

(New Regulation)

May) (Time: 3 Hours

Maximum: 75 Marks

Answer any FIVE questions
Use of the statistical tables is permitted ***(5×15=75)***
All questions carry marks

1. Describe the modelling approaches used for hydrologic process and their features with suitable examples.

2. The following informations are recorded from a storm.

Time(min)	0-10	10-20	20-30	30-40	40-50	50-60
Rainfall intensity(cm/h)	3	6	4	7	3	1

Calculate the first three moments of the data about the origin.

3. Describe the method of least squares and derive the regression constants.

4. During the construction period of 10 years of reservoir, a coffer dam is required to be constructed with a capacity to take care of 5 year flood. What is the probability that
   a) the flood will not occur at all and
   b) it will occur twice during the construction period?

5. Describe the relationship between multivariate linear regression and multiple correlation co-efficient.

6. The number of rainy days in the first week of July at a particular rain range station for a period of 50 years is recorded as given below.

No. of rainy days	0	1	2	3	4	5	6	7
No. of years	2	9	15	13	7	3	1	0

Assuming that the binomial distribution can be used to model this event, estimate the parameter p. Test the goodness of fit of the binomial distribution at 5% significance level by chi-square test.

7. Describe the classification of Time series and discuss about the component sof time series.

8. Write short notes on the following:
   a) Log normal distribution.
   b) Standard forms of Bivariate equations.
   c) ARIMA model.

Register Number:

Name of the Candidate:

3501

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-101. STATISTICAL METHODS IN HYDROLOGY AND WATER RESOURCES ENGINEERING

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions **(5 × 15= 75)**

Permit "Frequency Factor Table"

1. a) Obtain the parameter 'λ' for the pdf $f(x)=\lambda e^{-\lambda x}$, $x>0$ using (i) method of moments (iii) method of maximum likelihood. (8)

   b) During the construction period of 10 years of a reservoir, a coffer dam is required to be constructed with a capacity to take care of 5 year flood. What is the probability that (i) the flood will not occur at and (ii) it will occur twice during the construction period? (7)

2. a) The observed annual peak flood of a river in m^3/s for a period of 20 years from 1991 to 2010 are given below. (8)
   190, 155, 298, 136, 137, 131, 140, 124, 185, 104, 91, 154, 109, 269, 164, 270, 142, 72, 130, 111.
   Compute the mean, standard deviation and skewness co-efficient for this sample.

   b) Calculate the median for the following: (7)

Discharge in cumec	300	320	340	360	380	400	420	440
No of days	6	7	9	11	12	15	8	18

3. The following table gives the observed annual values in the river Krishna at Karad. Estimate the flood peaks with return periods of 50,100 and 1000 years by using (a) log-peason type III distribution and (b) log-normal distribution. (15)

Water year Beginning	Flood Discharge (m^3/s)	Water year Beginning	Flood Discharge (m^3/s)	Water year Beginning	Flood Discharge (m^3/s)
1965	4760	1980	2848	1995	1356
1966	2673	1981	1942	1996	2944
1967	4482	1982	1261	1997	5954
1968	1527	1983	1931	1998	1541
1969	4267	1984	1797	1999	2111
1970	2428	1985	1393	2000	774
1971	2156	1986	1801	2001	911
1972	2190	1987	1323	2002	1121
1973	3051	1988	3205	2003	937
1974	3101	1989	2504	2004	4163
1975	3231	1990	4361	2005	6312
1976	4562	1991	3150	2006	6708
1977	3422	1992	2127	2007	3868
1978	2187	1993	1812	2008	2884
1979	2435	1994	3915		

4. a) Explain how to test the goodness of fit of a distribution to the observed data by Smirnov-Kolmogorov test. (7)

   b) The annual rainfall over a basin for a period of 21 years has a mean of 2396 mm and a standard deviation of 868 mm and has the following frequency distribution. (8)

Class interval	<1500	1500 to 2000	2001 to 2200	2201 to 2500	2501 to 3000	3001 to 3500	>3500
No of years of occurrence	4	2	5	3	1	3	3

   Test the goodness of fit of normal distribution to this data at 5% significance of interval.

5. Fourteen years of weighted rainfall (x) and corresponding runoff(y) for the month of July are given below. Develop a best fit linear relation (y=a+bx) between them. Calculate the parameters a, b, r and standard error. (15)

Weighted rainfall (cm)	12.5	11.1	5.9	18.2	25.3	17.0	7.7	4.9	8.8
Runoff(cm)	10.8	4.1	1.3	14.4	10.1	2.7	3.6	1.2	2.4

Weighted rainfall (cm)	9.6	10.3	16.2	5.8	2.8
Runoff(cm)	3.6	3.3	12.4	3.8	1.8

6. Explain the following terms

   a) Periodicity (3)

   b) Confidence limits (3)

   c) Null hypothesis (3)

   d) Probability density function (3)

   e) Kurtosis coefficient (3)

7. Annual values of ground water table fluctuations, rainfall and depth of water withdrawn from a watershed draining area of 100.sq.km are given below. Obtain a regression relation of the form $y = ax_1^b x_2^c$. Find the multiple correlation co-efficient. (15)

Storm date	1988	1989	1990	1991	1992	1993	1994	1995	1996
Rainfall (cm)	140	85	103	119	98	150	124	99	68
Depth of water pumped out(cm)	11	13	9	12	8	9	13	12	14
Water table fluctuations (cm)	50	32	47	50	60	90	57	52	24

8. a) Define a stochastic process. Differentiate between stationary and non-stationary processes and ergodic and non-ergodic processes. (8)

   b) Compute the lag-1 auto-correlation co-efficient for the time series given below. (7)

Time	1	2	3	4	5	6	7
x_i	4	3	5	4	6	5	8

Register Number:

Name of the Candidate:

3502

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-102. OPEN CHANNEL HYDRAULICS

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions **(5 × 15= 75)**

1. Find in terms of specific energy E, an expression for the critical depth in trapezoidal channel with bottom width b and side slope 1 vertical to n horizontal. (15)

2. a) Water is flowing in a stream which may be assumed rectangular in section with width 10m and depth of water 1m. The bed of the channel slopes at 1 in 2000 and this is constant for at least 2km upstream. Taking Chezy constant $C=60m^{1/2}/s$, calculate the steady flow in the channel. (6)

   b) A dam is placed across the channel (for above case), increasing the depth at the dam to 2m. Determine the depths of flow (making reasonable approximations) at 500metres upstream of the dam. (9)

3. a) The initial and sequent depths of a hydraulic jump in a horizontal rectangular channel are 0.6m and 3.6m respectively. What is the initial Froude number? What is the energy loss? (6)

   b) The depth and velocity of water downstream of a sluice gate in a horizontal rectangular channel are 0.4m and 6m/s respectively. Examine whether a hydraulic jump can possibly occur in the channel. If so find its sequent depth, head loss, relative loss and efficiency. (9)

4. Derive the basic equation of a uniformly progressive flow and deduce for a channel of rectangular cross section. (15)

5. a) Describe with sketches and examples the following types of open channel surges (i) type B (ii) type C. (6)

   b) A steady discharge of $25m^3/s$ enters a long rectangular channel 10m wide, bed slope 0.0001, Manning's roughness co-efficient 0.017, regulated by a gate. The gate is rapidly partially closed resulting in a reduction of the discharge to $12m^3/s$. Determine the depth and mean velocity at the trough of the wave, and the time taken for the wave front to reach a point 1 km downstream neglecting friction. (9)

6. a) Explain the following terms (i) bed load (ii) Suspended load (iii) wash load (6)

   b) It is intended to stabilize a river bed section with the following data by depositing a layer of gravel or stone pitching. (9)

   Channel width =20m

   Bed slope =0.0045

   Max. discharge $500m^3/s$

   Chezy's C=18 log (12R/d)

   Relative density of the bed material=1.65

   Determine the depth flow assuming the section to be rectangular and the minimum size of stone required for stability. Use shields criterion for stability: $\tau/\rho g\Delta d$. d is the mean diameter of the material.

7. a) Explain why distorted scale models of rivers are commonly used. (6)

   b) A 1:50 model of part of a river is to be constructed to investigate channel improvements. A steady discharge of $420m^3/s$ was measured in the river at a section where the average width was 105m and water depth 3.5m. Determine the corresponding depth, velocity and discharge to be produced in the mode. Check that the flow in the model is in the turbulent region and discuss how the boundary resistance in the model could be adjusted to produce geometrical similarity of surface profiles. (9)

8. **Write short notes on any three of the following:** (3×5=15)

   a) Incipient motion of sediment

   b) Regimes of flow

   c) Conveyance of an open channel

   d) Specific energy and specific force

   e) Application of hydraulic jump

Register Number:

Name of the Candidate:

3503

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-103: SURFACE WATER HYDROLOGY

(Common with Part-Time)

November] [Time : 3 Hours

Maximum : 75 Marks

(Max: 60 marks for those joined before 2011-12)

Answer any FIVE questions
All questions carry equal marks

1. Discuss briefly the hydrologic cycle concepts with neat sketches. (15)

2. a) Describe the vertical structure of the atmosphere.
   b) Brief the following terms: (2×7 ½ =15)
      i) Conduction
      ii) Convection
      iii) Radiation

3. Describe with neat sketches the tipping bucket and float type rain gauges with neat sketches. (15)

4. Thesis on polygons constructed for a network of 10 rain gauges in a river basin yielded Thiessen on weights of 0.10, 0.16, 0.12, 0.11, 0.09, 0.08, 0.07, 0.11, 0.06 and 0.10. (15)

   If the rainfalls recorded at these gauges during cyclonic storm are 132,114,162,138,207,156,135,158,168 and 150mm respectively determine the average depth of rain fall of Thiessen mean and arithmetic mean methods. Also determine the volume of surface run off at the basin a, t let if 35% of rainfall is lost as in filtration. Take the area of the basin as 5800Km^2 and express your answer in Million cubic metres.

5. a) Discuss briefly the various atmometers, evaporation pans used in the measurement of evaporation.
   b) Find out the evaporation, if 4.75 litres of water is removed from an evaporation pan of diameter 1.22m and the simultaneous rainfall measurement is 8.8mm. (7 ½ ×2=15)

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6. a) Define the term stream flow hydrogrpah and discuss the various stream flow sources. (7 ½)
   b) A 6 hour strom produced rainfall intensities of 7, 18, 25, 12, 10 and (7 ½)

   3mm/hour in successive one hour intervals over a basin of 800 square kilometers. The resulting run off is observed to be 2640 hectare-metres. Determine the ϕ index for the basin.

7. Define the term unit hydrograph and give the assumptions made in the unit hydrograph theory. Also give the step by step procedure involved in the derivation of unit hydrograph. (15)

8. Briefly describe the following terms (3×5=15)
   a) Lumped system working
   b) Intensity duration frequency relationship(IDF)
   c) Hydrologic design scale

Register Number:

Name of the Candidate:

3504

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-104/301: GROUND WATER HYDROLOGY

(New Regulation)

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions

1. Explain zone of Aeration and zone of saturation. (15)
2. Explain Geologic formations as Aquifers and write the types of Aquifers. (15)
3. Explain groundwater flow rate and ground water flow direction with neat sketches. (15)
4. Describe the steady unidirectional flow and steady radial flow to a well. (15)
5. Explain the following with neat sketches:
   a) Well flow near aquifer boundaries (5)
   b) Multiple well systems (5)
   c) Partially penetrating wells (5)
6. Explain test holes and well log and describe the methods for constructing shallow wells. (15)
7. Explain the fluctuations due to evapotranspiration and meteorological phenomenon. (15)
8. Explain the following:
   a) Time Variations of levels. (5)
   b) Earthquakes (5)
   c) Land subsidence and ground water (5)

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Register Number:

Name of the Candidate:

3505

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING MANAGEMENT)

(FIRST SEMESTER)

WREC-105/302. WATERSHED MANAGEMENT FOR SUSTAINABLE DEVELOPMENT

(Common with Part Time)

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions **(5 × 15= 75)**

1. a) Discuss social aspects of watershed management within the perspective of sustainable development. (7)

   b) Explain the steps involved in watershed delineation. (8)

2. a) Illustrate any two commonly adopted methods to estimate the water yield from large watershed. (8)

   b) Explain any two methods available to assess the ground water potential areas. (8)

3. a) Illustrate necessity of sustainable agricultural management practices. (8)

   b) Distinguish between dry and land agriculture and runoff agriculture. (7)

4. Explain the sprinkler layouts and patterns of (i) permanent system (ii) semi-permanent system (iii) portable system. (15)

5. What are the benefits and environmental impact of irrigation with saline water to the society? (15)

6. a) What are the important characteristics of community based watershed management? (7)

   b) Explain important issues in soil and water conservation. (8)

7. Describe the guiding principles of Dublin statement on water and sustainable development and write its action agenda and follow up plan. (15)

8. a) Explain the necessity of farmers organization. (7)

   b) What is water user association? Explain its role on sustainable agriculture practice? (8)

Register Number:

Name of the Candidate:

3510

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING MANAGEMENT)

(FIRST SEMESTER)

WREC-204/ENVC-105. PIPE LINE ENGINEERING

(Common with Environmental Engineering)

November] [Time : 3 Hours

Maximum : 75 Marks

Answer any FIVE questions

1. a) Discuss the basic hydraulic principle adopted in the water supply system. (10)

   b) Brief the labeling procedure of network elements. (5)

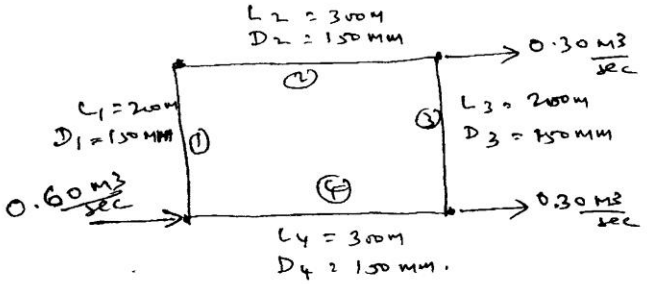
2. Explain the following network analysis methods with sketches. (3×5=15)

   a) Newton Raphson method

   b) Linear Theory method

   c) Hardy cross method

3. Analyse a single looped pipe network as shown in fig(1) for pipe discharges using Hardy Cross method. Assume a constant friction factor f-0.02 for all the pipes in the network. (10) (15)



4. Find the diameter of a 3Km long cast iron pipe, to carry water at a rate of $3m^3$/min, if the permissible hard loss is 20m.Use. (15)

   a) Darcy –Weisbach formula with e =0.90

   b) Hazzen William's formula with C_Hw =100

5. a) Discuss the interactive method and direct method of dynamic analysis used in the pipe network analysis. (10)

   b) Discuss the Head dependent analysis and its practical applications. (5)

6. Discuss with neat sketches, the step by step procedure of node flow analysis with its practical applications. (15)

7. Discuss briefly about the static and dynamic models used for prediction of chlorine concentrations. (15)

8. a) Briefly describe, the network calibration methodology. (10)

   b) Write in details, the various software packages used in network analysis. (5)

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3514

M.E. DEGREE EXAMINATION, 2015

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(THIRD SEMESTER)

WREE-301/ 106/303.HYDRAULIC STRUCTURES

(Common with Part-Time)

(Elective)

(New Regulation)

November] [Time : 3 Hours

Maximum : 75 Marks

(Max: 60 marks for those joined before 2011-12)

Answer any FIVE questions
All questions carry equal marks

1. a) Explain various types of reservoirs.
   b) Describe in brief various investigations required for reservoir planning.
2. a) Discuss the merits and demerits of various types of dam.
   b) Explain the factors on which selection of site for a dam depends.
3. a) What do you understand by gravity dam? Explain various forces acting on a gravity dam.
   b) Discuss various modes of failure of a gravity dam.
4. a) Explain the causes for failure of earthen dams.
   b) Discuss the criteria for safe design of an earthen dam.
5. a) What is a syphon spillway? Sketch a saddle siphon spillway and explain the functions of its various components.
   b) Describe various types of spillway crest gates.
6. a) Discuss various types of weirs. Distinguish between a weir and barrage.
   b) What is meant by scour? What precautions are taken against it in a weir design?
7. The slope of channel in alluvium is $S=\frac{1}{5000}$; Lacey's silt factor=0.9; channel side slopes ½:1. Find the channel section and the maximum discharge which can be allowed.
8. Write short notes on:
   a) Losses in channels
   b) Causes of failure of weirs
   c) Construction pore pressure in earthen dams
   d) Storage zones of a reservoir

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(b) With example and neat sketches, show typical MA first and second order processes, AR first and second order processes and ARMA first and second order processes. (9)

8. Write short notes on any THREE of the following :

(i) Auto - correlogram.

(ii) Partial auto - correlogram.

(iii) Yule - Walker equations.

(iv) Ergodic process.

(v) Variance density spectrum.

(vi) Transient series. (3 × 4 = 12)

Name of the Candidate :

2161

M.E. DEGREE EXAMINATION, 2003

(PART - TIME)

(FIRST SEMESTER)

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

WREC - 101. APPLIED STATISTICS AND STOCHASTIC PROCESSES

(Common with Part - Time)

November] [Time : 3 Hours

Maximum : 60 Marks

Answer any FIVE full questions.
All full questions carry equal marks.
Statistical Tables are permitted to be used.

1. (a) With suitable example, distinguish between arithmetic, geometric and harmonic means. (6)

(b) Draw a histogram and a frequency curve for the following :

Rain - fall (mm)	Frequency
0 - 10	2
10 - 20	8
20 - 30	30
30 - 40	35
40 - 50	40
50 - 60	32
60 - 70	25
70 - 80	15
80 - 90	10
90 - 100	2

(6)

2. The following Table shows the measurements of stage and discharge for the stage - discharge relationship. Assume a second order polynomial of the form $Q = a + bH + c H^2$ for the rating curve. Compute the values of *a*, *b*, and *c*, using

least squares estimation for a best fit. State the assumptions of the least squares approach and discuss their validity in this case :

Stage - H (mm)	Discharge - Q (cumec)
10	762
9·0	329
8·5	272
8·0	189
7·5	120
7·0	113
6·5	100
6·0	88
5·5	79
5·0	71
4·5	60
4·0	51
3·0	40
2·0	24
1·0	12

(12)

3. Write notes on any THREE of the following :

   (a) Method of moments.

   (b) Linear regression.

   (c) Multiple regression.

   (d) Curvilinear regression.

   (3 × 4 = 12)

4. (a) Give expressions for Binomial and Poisson distributions. Explain when Binomial and Poisson distributions can be inter - changeable. (4)

   (b) Enlist the application of normal distribution in water quality data and indicate the salient features of a normal curve. (4)

   (c) Using Poisson's distribution, compute the probability that a 5 year flood will occur fewer than four times in a period of 10 years. (4)

5. The number of rainy days in the second week of June at a particular gauging station for a period of 50 years as recorded, is given below :

Number of rainy days	Number of years
0	1
1	8
2	15
3	13
4	7
5	3
6	2
7	1
8	0

Assuming a binomial distribution to model this event, estimate the parameter P. Test the goodness of fit of the binomial distribution at 5 % level of significance by χ^2 test. (12)

6. (a) Explain briefly the Chi - square test. (4)

   (b) A die is tossed 120 times with the following results :

Number turned up	Frequency
1	25
2	28
3	20
4	12
5	18
6	17
Total	120

Test the hypothesis that the die is unbiased. (8)

7 (a) Write expressions for a :

   (i) MA (q) process.

   (ii) AR (p) process.

   (iii) ARMA (p, q) process. (3)

Register Number: 2162

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2003

(Water Resources Engineering & Management)

First Semester

WREC-102. FREE SURFACE FLOW

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any five full questions.
All questions carry equal marks.
Draw sketches wherever necessary.

1. a) Describe the pressure distribution in channel sections? (6)

   b) The velocity distribution in a very wide river 3m. deep is found to be approximately with the equation

   $u = 1 + 2(y/a)^{1/2}$. Calculate α and β. (6)

2. a) Discuss about energy and momentum principles applied to open channels. (6)

   b) Water flows in a rectangular channel 1m wide at a depth of 0.1m and a velocity 1.5m/s. If $\nu = 10^{-6}\ m^2/s$. , find the state of flow. (6)

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3. a) A discharge of 20 m^3/s. flows in a 10m wide rectangular channel under the critical condition. Find the depth and specific energy corresponding to this condition. Also find the critical slope if n=0.015. (6)

   b) Find the discharge in a trapezoidal channel with a bed width of 10m, side slopes 1:1 and depth of flow of 2m; under uniform flow condition. $S=10^{-4}$ and n=0.02. Also find Chezy's constant value at this depth. (6)

4. a) What are the conditions to be fulfilled when the flow is critical (6)

   b) Which section is called as control section for a overflow dam? Why? (6)

5. a) Derive the specific energy interms of critical depth. (4)

   b) For a trapezoidal channel with bottom width 40m and side slopes 2H:1V, Manning's N is 0.015 and bottom slope is 0.0002. If it carries 60 m^3/s discharge, determine the normal depth. (8)

6. a) What are the assumption made for analysing gradually varied flow? (6)

   b) Define length of backwater curve & derive the same. (6)

7. In a rectangular open channel due to a weir, the flow depth raising from 1.5m in a normal depth to 2.5m at the Weir. Width is 10m; Slope is 1 in 10000. Find the approximate length of backwater curve; Mannings n is 0.02. Consider average velocity, average depth & average slope midway between two sections. (12)

8. Write short notes on
   a) Types of channel slopes
   b) Assumptions in Hydraulic Jump analysis.
   c) Positive and negative surges. (3x4=12)

(b) Given below are the monthly rain-fall P and the corresponding run-off R values covering a period of 18 months for a catchment. Develop a correlation equation between R and P.

Month	Precipitation P	Run-off R	Month	Precipitation P	Run-off R
1	5	0·5	10	30	8·0
2	35	10·0	11	10	2·3
3	40	13·80	12	8	1·6
4	30	8·20	13	2	0·0
5	15	3·10	14	22	6·5
6	10	3·20	15	30	9·4
7	5	0·10	16	25	7·6
8	31	12·0	17	8	1·50
9	36	16·0	18	6	0·50

8. (a) Describe with neat sketch on flow duration curve. (6)

(b) Differentiate the following :

(i) Hydrograph and unit hydrograph.

(ii) Hyetograph and hydrograph. (6)

2163

M.E. DEGREE EXAMINATION, 2003

(FIRST SEMESTER)

(WATER RESOURCES ENGINEERING MANAGEMENT)

WREC - 103. SURFACE WATER HYDROLOGY

(Common with Part - Time)

November] [Time : 3 Hours

Maximum : 60 Marks

Answer any FIVE full questions.
All questions carry full marks.

1. (a) Needs and importance of hydrology. (4)

(b) Explain about the hydrological and its role on hydrology study. (8)

2. (a) What are the factors affecting the climate ? (5)

(b) Explain the role of hydrometeorology on hydrological problems. (7)

3. (a) Write characteristics of precipitation of India. (5)

(b) What are the methods available for convert the point rain-fall values at various stations into an average value over a catchment and explain catchement ? (7)

4. (a) A catchement has six rain-gauges stations. In a year, the annual rain-fall recorded by the gauges are as follows : (6)

Station	Rain-fall (cm)
A	82·6
B	102·90
C	180·30
D	110·30
E	98·80
F	136·70

For a 10 % error in the estimation of the mean rain-fall, calculate the optimum number of stations in the catchement.

(b) Explain with neat sketch about Depth - Area duration curve. (6)

5. (a) Write briefly about intensity - duration - frequency relationship. (4)

(b) Define evaporation. Explain the factors influencing the process of evaporation. Describe how do you estimate the crop-water requirement from pan evaporation ? (8)

6. (a) Define the following :

(i) potential evapo-transpiration.

(ii) actual evapo-transpiration. (4)

(b) Describe how do you estimate the reservoir evaporation and methods for its reduction of evaporation ? (8)

7. (a) Explain the factors affecting the run-off. (4)

Register Number: 2164

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2003

(Water Resources Engineering & Management)

First Semester

WREC-104. Ground Water Hydrology

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE full questions.
All questions carry equal marks.
Draw the sketches wherever necessary.

1. a) Discuss about the groundwater potential in our country. (6)

   b) What are the steps to be followed for the ground water investigations. (6)

2. a) What are the geologic formations called as types of aquifers. (6)

   b) Describe the vertical distribution of ground water. (6)

3. a) Describe the intrinsic permeability and hydraulic conductivity. (6)

   b) Discuss about the general flow equation in radial Co-ordinates. (6)

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4. a) Describe a flow net for an Isotrophic aquifer. (6)

   b) Define ground water contours and explain how it can be used in the field. (6)

5. a) Discuss about steady radial flow into a well. (6)

   b) List out the assumptions in Thiem's equations. (6)

6. a) Explain about Chow's method of solution of Theis equation. (6)

   b) Discuss about leaky artesian aquifer and lenkage factor. (6)

7. a) Describe about a construction of well completion and its necessity. (6)

   b) Describe the importance of collector wells. (6)

8. a) How will you select a site for the construction of a well. (6)

   b) List out, what are the interpretations can be made by using water table fluctuation details? (6)

Register Number:

Name of the Candidate:

2165

M.E. DEGREE EXAMINATION, 2003

(Water Resources Engineering & Management)

First Semester

WREC-105.WATER RESOURCES PLANNING

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any five questions
All questions carry equal marks

1. What are the characteristics of water resources planning or management problems that are most suitable for analysis using quantitative system analysis techniques? (12 Marks)

2. What are the factors to be considered in the planning of water resources project? Explain them in detail. (12 Marks)

3. List the possible objectives of a surface water reservoir and identify some of the conflicting objectives. In the case of multi-objectives projects, discuss how the objectives or goals of the project are formulated. (12 Marks)

4. What is the main intangible benefit with respect to a flood control project? Discuss about it. (12 Marks)

5. What are the various types of data required for planning water resources projects? Discuss about the relevance of geology data and socio-economic data in water resources planning. (12 Marks)

6. What are the points to be considered while evaluating alternative water resources proposals? Explain with examples. (12 Marks)

7. What are the alternatives to rain water harvesting to augment the fresh water availability in a city? Discuss the merits and demerits in terms of quantity, quality, sustainability and socio-economic considerations. (12 Marks)

8. Discuss in length the various mathematical models used in water resources planning studies. (12 Marks)

Register Number: 2166

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2003

(Water Resources Engineering & Management)

WREE-106. Irrigation Water Management

(Elective-I)

(Common with Part-time)

November) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE full questions.
All questions carry equal marks.

1. a) Discuss about the necessity of irrigation to our country.

   b) Explain the physical properties of soil which are affecting the soil water relationship.

2. a) Describe the infiltrometers and their working principle with sketches.

   b) Explain the types of estimation of infiltration.

3. a) Describe the methods of measurement of hydraulic conductivity.

   b) Discuss about optimum moisture percentage.

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4. a) Explain the process of Evaporation.

   b) What are the methods used to estimate the Potential evapotranspiration.

5. a) How will you determine the effective rainfall from a Complex storm.

   b) State the procedure to determine the base flow of a continuous rainfall.

6. a) Explain the methods of application of water to crops.

   b) Discuss about the advantages of Drip Irrigation.

7. a) List out the types of irrigation requirements.

   b) A soil has filed capacity of 22% and wilting coefficient of 10%. The dry unit weight of soil is 1.5 gm/cc. If the root zone depth is 70cm, determine the storage capacity of the soil. Irrigation water is applied when moisture content falls to 14%. If the water application efficiency is 75% determine the water depth required to be applied in the field.

8. Write short notes on the following:

   a) Suitability of irrigation water
   b) Sprinkler irrigation
   c) Soil water constants.

Register Number: **5902**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(WATER RESORUCES ENGINEERING & MANAGEMENT)

FIRST SEMESTER

WREC–102. FREE SURFACE FLOW

(Common with Part Time)

November] [Time : 3 Hours

Maximum : 60 Marks (5 × 12 = 60)

Answer any FIVE questions
Draw sketches wherever necessary

1. a) Explain how would you calculate momentum coefficient if the velocity distribution in a channel is known.

   b) Write a note on effect of slope of channel on the pressure distribution.

2. a) Determine the normal discharge in a rectangular channel 20m wide having depth flow of 6m. Take Mannings n = 0.015 and slope s = 0.0020.

   b) Explain why uniform flow cannot occur
   a) in a frictionless channel
   b) in a horizontal channel

3. A bridge is planned on a 50m wide rectangular channel carrying a flow of 200 m^3 / sec at a flow depth of 4.0m. For reducing the length of the bridge, what is the minimum channel width such that upstream water level is not influenced for this discharge?

4. a) Prove that the gradually varied flow equation for a wide rectangular channel may be written as $\frac{dy}{dx} = S_0 \frac{1-\left(y_n/y\right)^{10/3}}{1-\left(y_c/y\right)^3}$

   b) What are M_1 , C_1, S_2 and A_3 profiles explain?

5. What are the methods available to compute the water surface profile? Explain any one method in detail.

6. a) Derive the dynamic equation for uniformly progressive flow in a prismatic channel.
   b) State the methods for the solution of unsteady flow equations. Explain briefly any one method.

7. a) Derive an equation for the energy loss in a hydraulic jump.
   b) What is a hydraulic bore? Explain.

8. Write short notes on any two
   a) Specific energy and specific force
   b) Normal and critical slopes
   c) Positive surges.

Register Number: **5904**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(WATER RESOURCE ENGINEERING & MANAGEMENT)

FIRST SEMESTER

WREC–104. GROUNDWATER HYDROLOGY

(Common with Part Time)

November] [Time : 3 Hours

Maximum : 60 Marks

Answer any FIVE questions
Draw sketches wherever necessary

1. a) Explain the following terms
   (i) Specific retention.
   (ii) Intrinsic permeability
   (iii) Perched aquifer (6)
   b) Describe all types of aquifers. (6)

2. a) Describe the Darchy's law and its validity. (6)
   b) An aquifer of 930 sq. km is bounded by confined aquifer of 22 m thick. The average maximum and minimum piezometric level variations ranges between 5-12 m. Taking storage coefficient as 0.001, calculate the annual rechargeable ground water storage from the area. In a year about 250 days of pumping from 40 wells irrigate this area. Calculate the average well yield. (6)

3. a) In an unconfined aquifer of 2 sq–km. The original water table was 12•3m below ground level. Pumping of 10^6 m^3 of water from the area dropped the water table to 15.1 m below ground level. Calculate (1) specific yield of the aquifer (2) specific retention if porosity of aquifer is 23%. (6)
   b) How will you find coefficient of permeability in the field? (6)

4. a) Describe the ground water flow rates and flow nets. (6)
   b) A barrage of length is 1.0 km., discharges considerable flow below its foundation. There are 30 flow channels and 45 equipotential drops constructed in the flownet. If the coefficient of permeability is 0.8 cm/ sec. an the head difference between upstream water level and downstream tail water level is 18m., Calculate the discharge per unit width of the barrage, and also the total discharge. (6)

5. a) Derive an expression for unsteady radial flow in a confined aquifer. (6)
   b) Describe the specific capacity of well and well efficiency. (6)

6. a) Describe the well protection and well improvement methods. (6)
   b) Discuss about the infiltration Galleries and collector wells. (6)

7. a) A horizontal infiltration gallery 100m long has water at an elevation of 373.0 m. The water table is at RL 379.0 m. located 250m away from the face of Gallery. If the permeability of aquifer is 2m/hr. Calculate the flow into the gallery. (6)
   b) Describe the environmental influences on ground water fluctuation. (6)

8. Write short notes on the following (4×3=12)
   i) Rock properties affecting ground water
   ii) Flow across a water table
   iii) Well interference
   iv) Land subsidence

Register Number: **5906**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(WATER RESOURCE ENGINEERING & MANAGEMENT)

FIRST SEMESTER

WREE–106. SOIL AND WATER CONSERVATION ENGINEERING

(Common with Part Time)

November] [Time : 3 Hours

Maximum : 60 Marks

Answer any FIVE questions
Draw sketches wherever necessary

1. a) Why soil erosion occurs due to water? Explain the factors affecting erosion? (6)

   b) How will you control the erosion using strip cropping? (6)

2. a) Explain the parameters of wind which causes wind erosion? (6)

   b) What are the soil factors you will control to reduce the wind erosion? (6)

3. a) How the vegetated water ways helps in soil conservation? (6)
   b) Explain how to establish vegetation in water ways and its maintenance. (6)

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4. a) Describe the procedure of terrace system construction. (6)
   b) Explain any one temporary and one permanent structure used for conservation of soil and water. (6)

5. a) What are the types of flood and what is their economics? (6)
   b) How floods are prevented? (6)

6. a) What is sub–surface drainage? What is its benefits in terms of soil and water conservation? (6)
   b) How will you zone a flood plain? (6)

7. a) Explain in detail about pipe drains in sub–surface drainage. (6)
   b) Explain how the evaporation suppression conserve water in large reservoirs? How will you suppress the evaporation loss in these reservoir? (6)

8. Explain the procedure adopted for reclamation of saline and acidic soils world wide. (12)

Register Number: **9002**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2005

(WATER RESOURCE ENGINEERING & MANAGEMENT)

FIRST SEMESTER

WREC-102. FREE SURFACE FLOW

(Common with Part Time)

May] [Time : 3 Hours

Maximum : 60 Marks

All questions carry equal marks

Answer any FIVE questions

Draw sketches wherever necessary

1. a) Derive an expression for the specific force for a rectangular channel.
   b) Explain how would you calculate energy coefficient if the velocity distribution in a channel is known.

2. a) Show that the relation between the alternate depths y_1 and y_2 in rectangular channel can be expressed by

$$\frac{2y_1^2\ y_2^2}{y_1 + y_2} = y_c^3$$

   where y_c is the critical depths.
   b) Explain (i) Conveyance (ii) Section factor

3. A 4m wide rectangular channel is carrying 10 m^3/sec at a depth of 2.5m/ There is a step of rise 0.2m in the channel bottom. Assuming there are no losses determine the flow depth over the step. Does the water surface rise or fall at the step.

4. a) Derive the dynamic equation for gradually varied flow. State the assumption.
   b) Write a note on classification of water profiles.

5. A 10 m wide rectangular channel carries a discharge of 40 m^3/sec. If at a section in this channel, the depth is 1.5m, how far upstream or downstream from this section will the depth be 2.0m. Take S_0=0.00009 and n=0.017.

6. a) Derive the dynamic equation for gradually varied unsteady flow.
   b) Explain monoclinal rising wave.

7. a) What is moving hydraulic jump? Explain.
   b) Explain positive surges.

8. Write short notes on any two
   a) Surges in power canals
   b) Pressure distribution in open channels
   c) Direct step method for computation of water surface profile.

Register Number: **3521**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2008

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-101.APPLIED STATISTICS AND STOCHASTIC PROCESS

(Common with part time)

Nov) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL questions
Assume required data wherever necessary

1. a) What are the four methods to calculate the mean? (4)

   b) A Basin has the following Stations. Calculate the mean rainfall of the basin from the following data, by four methods.

Station	A	B	C	D	E	F	G	H	I
Rain fall(cm)	51.8	32	28.7	43.4	38.6	50.5	59.6	31.5	31.7
Area covered by the station (Sq.Km)	31	58	31.5	31	86	71	27	43.5	66.0

(8)

2. Write short notes on the following:
   i) Variance ii) Skewness
   iii) Kurtosis iv) Frequency Distribution
   (4×3=12)

3. For any day in July, there is 20% chance of rainfall. A building slab is to be cast which requires no rainfall during its casting period extending over 5 days. What is the probability of having no rainfall during these days and one rainy day during the period? (12)

4. Write short notes on the following
   i) Gumbel Distribution.
   ii) Log Pearson Type III distribution.
   iii) Normal Distribution. (3×4=12)

5. Explain the relation ship between standard error correlation coefficient and coefficient of determination. (12)

6. A Linear relation of the form y=a+bx is to be fitted to the sample of n values. Determine theoretically the parameters a and b by method of least square. (12)

7. Describe a Correlogram and derive a first order auto Regressive Process. (12)

8. Explain continuous spectrum and smoothing of spectral density estimates. (12)

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Register Number: **3522**

Name of the Candidate:

M.E. DEGREE EXAMINATION, 2008

(WATER RESOURCES ENGINEERING AND MANAGEMENT)

(FIRST SEMESTER)

WREC-102.FREE SURFACE FLOW

(Common with part time)

Nov) (Time: 3 Hours

Maximum: 60 Marks

Answer any FIVE FULL questions
Draw sketches wherever necessary
All questions carry equal marks

1. a) What are the classification of Free Surface Flow?

   b) Describe the momentum principle in Open Channel Flow.

2. a) Discuss about the velocity distribution and pressure distribution in Open Channel Flow.

   b) Determine the dimensions of the most economical trapezoidal earth lined channel (Manning's n=0.020) to carry 14 m^3/s at a slope of 4 in 10,000.

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3. a) What are the assumptions necessary for analyzing gradually varied flow?

   b) Classify the channel slopes.

4. Find the slope of the free water surface of a rectangular stream 15 m wide and 3 m deep. The slope of the stream bed is 1 in 5000. Total discharge is 29 m^3/s. Assume c = 65 and the depth is increasing in the direction of Flow.

5. a) Discuss about Backwater Curve and Drawdown Curve.

   b) Explain the classification of Surface Profiles.

6. a) Explain the dynamic equation for uniformly progressive flow in a open channel.

   b) Discuss about the solution of unsteady Flow Equations.

7. A river 90m wide and 3m deep has stable bed and vertical banks with a surface slope of 1 in 2500. Estimate the length of backwater curve produced by an afflux of 2m.
   Assume planning's n = 0.035

8. Write short notes on the following:
   1. Specific Energy Curve.
   2. Hydraulic Jump.
   3. Specific Force Curve.
   4. Negative Surge.

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