COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

Economics Planning and Management of Systems (EW 603)

Course: M.Tech

Branch: Civil Engineering (Environmental & Water Resources Engineering)

Semester: Sem III

Year: 2014-2015

Max.Marks:60

Duration: 3 Hours Time:- 2.00pm to 5.00pm

Date:30/11/2014

Instructions:

MIS No. | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

Q.1 a) The total cost of a hydropower project is 120.0 million Rupees. And the total project cost of an alternate thermal plant is Rs. 139.0 million. Calculate for the hydropower (i) Annual net benefit and (ii) benefit –cost ratio. The life of the projects is 50 years. The following data is given **05**

	Hydropower plant	Thermal Plant
Annual interest on capital cost	12%	11%
Annual Depreciation using sinking Fund	8%	8%
Annual O.M.cost as a % of capital cost	3%	10%

b) In a floodplain, the cropland is 20% planted with four crops. Hydrologic analysis reveals that 80% of the historic floods have occurred in season–I and 20 % in season-II. Crop income without flooding and with flooding in each season in Rs. Per hectare per year is as given below: **05**

Crop	% area occupied	Crop Income without flooding (Rs/ha)	Income with flooding (Rs/ha)	
			Season I	Season II
A	30	1560	910	1430
B	40	845	195	520
C	15	2600	130	2340
D	15	1100	800	950

What is expected damage per hectare to this cropland when it is flooded?

Q.2 a) Carry out reservoir operation of an irrigation reservoir from the following data given in Table using standard operating policy (SOP). **07**

Month	River flow (Ha.m)	Precipitation (Ha.m)	Evaporation Losses (Ha.m)	Irrigation Demand (Ha.m)
1	140	30	160	490
2	1560	120	110	440
3	1880	160	120	410
4	1230	220	140	320
5	480	120	220	530
6	60	0	120	660
7	0	0	100	740
8	0	0	80	680
9	0	0	60	640
10	0	0	110	590
11	0	0	160	680
12	0	0	220	760

The live storage capacity of reservoir is 5860 Ha.m and initial live storage is 500 Ha.m.

b) Suggest suitable rationing so that water is available from the storage at a uniform rate after monsoon for the data given in Q.2 a). **03**

Q.3 a) The following data is given for a watershed management project to estimate benefits from sediment control measures. **06**

Year	Reservoir storage		Demand of water (Mm^3)	Cost of watershed management measures (Rs. 10^9)
	With sediment control measures	Without sediment control measures		
1	100	100	68	5
2	98	96	71	5
3	96	92	74	5
4	94	88	77	5
5	92	84	80	5
6	90	80	83	5
7	88	76	86	5
8	86	72	89	5
9	84	68	92	5
10	82	64	95	5

Given: (i) Value of returns from water from sediment control measures is Rs. 2.0 x $10^9/Mm^3$ (ii) Discount rate is 12%

Calculate PW_b, PW_c and PW_{nb} from sediment control measures.

b) Using Separable Cost Remaining Benefit methods (SCRB) allocate the cost to various purposes for the following data. Total cost of reservoir is 525. All values are in Rs. 10^7. **04**

Item	Description	Purpose-			
		Flood control	Irrigation	Water power	Water supply
1	Gross benefits	150	150	220	210
2	Alternate single purpose cost	190	180	150	150
3	Separable cost	0	70	30	120

Q.4 a) Calculate the maximum net benefits graphically from the following data for a project. Also determine the optimum height of the dam. **06**

Dam height	Construction cost (Rs.million)	Reservoir capacity Mcum	Annual gross benefit (Rs.million)
10	4.0	5.0	16.0
20	7.5	11.0	21.0
30	12.5	17.0	27.0
40	18.0	26.0	33.0
50	27.5	36.0	39.0
60	50.0	50.0	47.0
65	55.0	60.0	45.5

b) A Water project is proposed to supply water for municipal and irrigation use. The demand curve for municipal use is given by $P+2y=10$, and the demand curve for irrigation is given by $2P+y=20$, where y is the demand and P is price in appropriate units. Determine the aggregate demand curve. **04**

Q.5 a) A pipeline is proposed to be laid from an existing pumping station to a nearby reservoir. Two alternate possible pipe sizes are considered: **06**

Pipe size	Cost/hr of pumping (Rs)	Initial cost of construction
A	5.0	80000
B	3.0	160000

Both pipe sizes have a life of 15 years, with no salvage value. Interest rate is 6%.

i) Which is the most economical pipe size if the total number of hours of pumping per year is 5000? Compare equivalent annual costs.

ii) How many hours of pumping per year are required to make the two pipe sizes equally economical?

b) Write short note on Environmental economics. **04**

OR

b) Two inputs, surface water (x_1) and ground water (x_2) should be combined to satisfy the relationship $x_1x_2=16$, in order to produce constant output, i.e. irrigation to a given area, all other things being the same. If the marginal costs of x_1 and x_2 are 4 and 1, respectively, determine the optimum values of x_1 and x_2.

Q.6 a) Differentiate between skimmed price and penetrating price. **02**

b) Explain indifference curves. **02**

c) Differentiate between economic analysis and financial analysis. **02**

d) Explain Price elasticity of demand. **02**

e) Discuss various environmental consequences of water resources projects. **02**

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