BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI (RAJ.)

CE G520 Infrastructure Planning and Management Duration: 180
Date: 12.5.2018 Comprehensive Examination (Open Book) MM: 105

Q.1 Three plans are being considered for the conversion of an existing two-lane roadway to a four lane freeway, in order to handle the larger volume of traffic expected from the expansion of a regional airport. Traffic volumes are projected to be 57000 passenger vehicles and 3000 tracks per day. Plan 'A' would add two new adjacent lanes. Plan 'B' would upgrade the existing two lanes and add two new adjacent lanes. Plan 'C' would be a new four –lane highway with a new alignment. Estimates for the alternative plans are given in the table that follows. The following costs are common to all plans:
Incremental operating cost (autos): Rs. 2.80 per km; Incremental operating cost (trucks): Rs. 7.40 per km
Value of time savings (autos): Rs. 3.00 per minute; Value of time savings (trucks): Rs. 4.50 per minute
Average accident cost: Rs. 280000

	Existing	Plan A	Plan B	Plan C
Annual maintenance cost (Rs/ lane-Km)	225000	187500	150000	150000
Accident rate	4.58	2.5	2.4	2.3
Construction cost (Rs/km)		37500000	97500000	120000000
Reduction in travel time (minutes)		Auto-2min Truck – 1min	Auto-3min Truck-3min	Auto-5min Truck-5min
Length	10	10	10	10.3

Which plan will be beneficial for next 10 years, if we consider a growth of 5% in traffic volume. Write your assumptions, if any, very clearly. If MARR is 6%, which plan is the best.

(35)

Q.2 It is proposed to have rooftop rainwater harvesting at a village in Rajasthan. The project is to provide drinking water to all villagers. For the purpose, it is decided to build tanks at household, colony and village level. Household and colony tanks to be connected by top $1/3^{rd}$ perforated pipelines so the overflow water from these tanks and surface runoff water flows to village tank which can be used for irrigation and cattle drinking water purposes. Colony tanks are connected to rooftop of schools, and other public buildings. A land is marked to grow the crops so that the generated revenues can be used to make the scheme sustainable. A well reputed institute was engaged to develop the scheme in scientific way and engineering design can be implemented. For adoption the scheme by villagers, cultural and social aspects were incorporated in the scheme. A social entrepreneur was encouraged to take care the scheme for next 25 years.
For the above scheme, it is proposed in a village of 2000 population and 500 cattle to build 100 tanks at the cost of Rs. 80000 each, 10 tanks at colony level with Rs. 200000 each and a village tank of Rs. 12 lacs. The cost of drinking water at market is Rs. 1 per liter and customers are ready to pay Rs. 2 per liter. The house hold tanks were connected by pipe line, filter, and other accessories with cost of Rs. 10000 each and these tanks were connected by other tanks (colony and village tanks) by pipelines costing Rs. 3000000. The land to grow crops for the sustainability purpose is given by villagers free of cost which might have been used for the grazing purpose of cattle which may cost Rs. 0.25 per cattle per day. In this land 1000 trees are planted with revenue of Rs. 200 each per year, for 5 years, Rs. 400 for next 10 years and Rs. 500 for next 10 years. Assume suitable cost for maintenance, wages (salary of one caretaker and other administrative cost), and electricity cost to run pump of ½ HP. The project is designed for 25 years, at the end of which it can be sold at 10% of the project cost. Carry out the financial and economical analysis of the project and calculate all relevant data and suggest suitable prices per liter water to make it viable. Assume min. attractive rate of return = 8% is the discount rates for both analysis. Comment.

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Q.3 The construction industry today has been built on the need of the worlds inhabitants to provide shelter, harness energy, and create public access. The basic human needs have not changed over time even though the process and environment in which designer or constructor operate have become increasingly more complicated. Rapidly escalating technology has made possible structure and processes unimaginable from generation to generation.
Problem Statement: Malaysian Construction industry now a days is facing a lot of problem which is resulted in loss of a billion ringgit. The main factors which give the instability to the construction industry are cost and time

planning. By news in mass media the cost and the time of the project are the main factors that lead to the incomplete or delay of the project. This causes a lot of problems to the client who has to pay back the loan to bank for even those projects which are not completed. Without proper planning the construction company may lose profit. The construction company should plan the project cost by taking the escalation in labour and materials price for the future. The uncontrolled usage of the other resources at the site is also the factor that leads to the loss of the profit. The time scheduling is also the major factor that leads to the delay in project. Today, the construction company is facing a tough challenge in the time planning which ultimately leads financial loss. Sometimes the construction companies do not concern about the environment factor during the project planning. The environment factor must be considered at the time of planning to make the project sustainable and reduce the life cycle cost. This will ultimately save the total cost of the project. Make suitable assumptions and write down the goals and objectives of the scheme. What kind of studies you will require in implementing the scheme; explain them in brief. Prepare an EIA report. For EIA, what are the factors you will consider, mention with weight age and sub grade factors. Also mention the mitigation steps you will recommend for them. Draw the value tree for the same.

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Q.4 Define the scenarios for next three years as per the previous records for the campus of BITS Pilani. Previous years data for the considered variables are given in the table. Suggest which years are suitable for significant usage of ground water with respect to the given scenarios (Consider that excess of the ground water recharge as compared to demand is suitable). Also suggest that how many students more can be accommodated in the campus if there is any future scope.

Develop only four scenarios:

(i) High demand low recharge
(ii) High demand and high recharge
(iii) Low demand and low recharge
(iv) Normal recharge and normal demand

Year	Rainfall (mm)	Evaporation (mm)	Population	Construction (m^3)
2010	476	186	4500	0
2011	681	174	4500	0
2012	299	185	4500	0
2013	566	172	4500	0
2014	551	160	4500	0
2015	318	153	4500	30150.6
2016	529	144	4500	50948.63
2017	467	133	4500	2832.762

The total watershed area identified in the campus is 1023023 meters. Take per capita consumption of water as 135-180 liters per day.

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