BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
SECOND SEMESTER 2022 – 2023
Infrastructure Planning and Management– Mid-Semester Exam

Course No: CE G520 **Date: 15-03-2023**
Duration: 90 Minutes, 11 AM-12.30 PM **Max. Marks: 40**

1. (a) Explain the different steps associated with rational planning of an infrastructure from technical perspective. [3]

   (b) What is the Built-Operate-Transfer scheme (BOT)? [1]

   (c) What is the difference between Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA)? [2]

   (d) Explain the steps need to be followed for conducting Environmental Impact Assessment (EIA) of a project? [4]

   (e) What is opportunity cost? [2]

2. Assume that you have six alternative strategies named as A, B, C, D, E, and F for major growth of an area. The evaluation groups and criteria are given. Table 1 represents results of using a scaled checklist with weights of 1.0. Decide the best and worst strategies for the development based on normalized score? '+' indicates that a plan performs well against a criterion, '-' indicates poor performance and '0' indicates indifferent performance. [5]

Table 1: Evaluation of alternate strategies

		Strategy					
	Evaluation group and criteria	**A**	**B**	**C**	**D**	**E**	**F**
I	***Impact on existing socio-economic land use structure***						
	Agricultural land	0	+	0	-	-	0
	Recognized villages	+	+	0	-	-	0
	Sites of special scientific interests	-	0	-	0	0	0
	Sites of historical/archaeological interests, antiques and monuments	-	0	0	0	0	0
	Use of derelict land	0	-	-	0	+	0
II	***Landscape impact and opportunities***						
	Sea interface: amenity and recreation	+	+	-	0	0	+
	Sea interface: Views	+	+	-	0	0	0
	Natural landscape: Views and recreation	-	0	+	0	-	+
	Integration of natural landforms in development	-	0	+	+	-	+
III	***Implementation and development***						
	Use of crown land	+	+	-	0	0	+
	Use of assembled private land	-	0	+	+	+	+
	Government and infrastructure requirements	-	+	+	0	0	+

3. (a) What is the difference between consumer surplus and producer surplus? [2]

   (b) The demand and supply curve (in $) equation is given as (-0.0006x+30) and (0.0006x+15), respectively. Quantity of goods sold is given in Table 2. Calculate the consumer surplus and producer surplus at the equilibrium price. **Note:** there is no need to draw the graph to scale.

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Table 2. Market scenario [6]

Quantity	x	0	5000	10000	12500	15000	20000	25000	30000	35000	40000	45000	50000

4. The following data is provided for a thermal project (electricity is generated from coal). This project will require a one-off expenditure of $200 million to expand the coal mining capacity of the existing mine near the proposed site. The project site is currently priced at $45 million. Other infrastructure related costs for the project are estimated to be $1700 million. This project will have 20 years of useful life. The coal is priced at $50 per tonne. This coal, if no used for power generation, can be exported at a price of $80 per tonne. Salaries and wages to the employees will cost $20 million annually and maintenance an additional 1 per cent of the capital cost. In social terms, i.e. in terms of shadow prices, salaries and wages will amount to $40 million. Assume 2 million tonnes of coals are burnt every year to generate electricity. 2000 million units of electricity is produced annually. Consumer is paying 20 cents per unit (1 dollar=100 cents). Also assume that 0.5 million tonne of coals are unused annually. What is the net present value of the project? The target rate of return of the project is 10% per annum. Calculate the internal rate of return. You may use the following equations. The end-of-life value of the project is 0.

$$NPV = -I_0 + (B - C) \times PVF_{i,n} + \frac{L_n}{(1+i)^n}$$

$$PVF_{i,n} = \frac{(1+i)^n - 1}{i \times (1+i)^n}$$

$$IRR = i_1 + NPV_1 \times \frac{i_2 - i_1}{NPV_1 - NPV_2}$$

[7+2]

5. The government has decided to proceed for a major renovation of an Urban Water Supply Infrastructure of a region. Assume the following statements are true to the case. Note: Assume no political interventions.

   Adequate water supply is not available to the consumer at farthest point.

   There is a significant gap between the quantity of water supply and quantity of water received.

   Water taxes are applicable to the area. However, there is a huge gap between the cost and revenue.

   In certain portion of the area, people are complaining about excessive smell of chlorine in water at the user point.

   In certain portion of the area, people are complaining about health issues after consuming the water due to bacterial growth.

   A survey is conducted and the water demand in the area is evaluated as 200 L/capita/day. According to the official data, an average urban Indian requires about 150 L/capita/day.

   Identify the objectives based on the above information. [6]