INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, BHOPAL

MID-SEMESTER EXAMINATION
ACADEMIC YEAR: 2018-19, SEMESTER-II

COURSE: ECO311/611 **FULL MARKS: 30**

▶ *Answer all the following questions. (Two hours.)*

Q 1. Consider the following public project implementation problem (say, developing a green zone in the city or building a flyover). The cost must be funded by the agents themselves. Let the cost of the public project is $C > 0$ and for an agent $i \in N := \{1, 2, \ldots, n\}$, $m_i (> 0)$ and $\theta_i (> 0)$ receptively denotes the available endowment (money) (to the agent i) and (his/her) willingness to contribute. Consider the following mechanism $(f(\theta), p(\theta))$ where,

$$\forall i \in N, \forall \theta \in \Re_+^n, \quad f(\theta) = \begin{cases} 1 & \text{if } \sum(\theta_i) \geq C, \\ 0 & \text{if } \sum(\theta_i) < C. \end{cases}$$

and $p_i(\theta) = f(\theta)C/n$. Utility or net payoff of agent i is $U_i(f(\theta), p_i(\theta), m_i) = f(\theta)\theta_i - p_i(\theta) + m_i$. Is the given mechanism implements 'f' in dominant strategies? What can you say about individual rationality in this context? Can you provide with an indirect mechanism for the above problem? (4+2+2)

Q 2. Consider that two flatmates in a shared apartment are planning whether to buy AC or not. Their (individual) valuation for having AC belongs to $\{\underline{\theta}, \bar{\theta}\}$, $(\underline{\theta} > 0)$. Cost of installing an AC in the room belongs to $(\underline{\theta}, \bar{\theta})$. The AC is installed only if at least one of the roommate's valuation is $\bar{\theta}$. Assume that participation is compulsory. What mechanism would implement this allocation problem in strategy-proofness?

Now assume that participation is voluntary in the sense that the roommate who is not willing to participate, will neither pay anything nor will access the benefit of AC. Is there such a mechanism that will grantee ex-post efficiency, strategy-proofness and voluntary participation? (5+5)

Q 3. Define Bayesian Incentive Compatibility (BIC). Show that dAGVA mechanism is BIC, efficient and budget balanced. (2+4)

Q 4. Consider a single object auction problem where the object is given with probability $(1 - \frac{1}{n})$ to the highest valued agent. It gives the object to the second highest valued agent with probability $\frac{1}{n}$. Is the above allocation rule implementable in DSIC as well as BIC? Construct the payment rule that implements it in DSIC? Can you have budget balancedness in this context? (1+3+2)