MASTER OF ARTS EXAMINATION, 2023

(2nd Year, 1st Semester)

ECONOMICS

[MICROECONOMICS - 2]

Time : Two Hours Full Marks : 30

Attempt ***Q.no. 1*** and any ***one*** from the rest.

1. Consider a principal who hires an agent to run a very simple stochastic technology. The agent when hired may decide to exert a productive effort *e* that may take one of the two values 0 and $\phi > 0$. Assume that the high level of effort $e = \phi$ entails a cost to the agent of size ϕ, while the low level of effort *e = 0* entails no cost.

   If the agent chooses effort e = 0 then output y is equal to 1 with probability p_0, and y=0 with probability $1- p_0$. On the other hand, if the agent exerts effort $e = \phi$, then y=1 with probability p_1, and y=0 with probability $1–p_1$. We assume $p_1 > p_0$.

   Finally, assume both the principal and the agent to be risk neutral, the agent has a reservation utility normalized to 0, and that any contract offered to the agent needs to satisfy a limited liability constraint specifying that the agent cannot be paid a negative amount.

   Assume first that the level of effort *e* **is verifiable**.

(a) Solve for the first best optimal contract that the principal offers the agent to induce him to exert the high effort $e = \phi$?

(b) Solve for the first best optimal contract that the principal offers the agent to induce him to exert the low effort $e = 0$?

(c) When will the optimal first best contract induce the agent to exert high effort ?

Now assume that the effort e **is non-verifiable** while the amount of output y is verifiable.

(d) Try to characterize the second best optimal contract when the principal wants the agent to exert the high level of effort i.e., $e = \phi$. Also find the payoffs of the principal and the agent ?

(**Note : No need to solve for the optimal second best contract when the low level of effort is exerted (i.e**. $e = 0$, **just concentrate on** $e = \phi$) 2+2+3+8

2. (a) Consider 2 individuals 1 and 2 in an economy who can contribute to the production of a public good. Contribution is a 0-1 decision, 1 implies that the individual contributes and 0 otherwise. Public good is provided if at-least one individual contributes. The benefit from public good provision is normalized to 1 and this is common knowledge. Assume both individuals to be symmetric. The cost of contribution for both individuals is private

information to both individuals and the possible costs are distributed **uniformly** within the range [0,3]. Write the payoffs of the game clearly. Show that both individuals will contribute if and only if their costs are sufficiently low and find that threshold value of cost below which both will contribute?

(b) What is Monotone Likelihood Ratio property ? How does that impact the optimal wage schedule in hidden action problems ? (State as briefly as possible). (2+8)+(3+2)=15

3. (a) Consider a standard Cournot duopoly (complete information) : two firms simultaneously choose output levels to maximize their profits. the market inverse demand is $P = 1 - q_1 - q_2$ where q_1 is firm i's output. Each firm incurs a fixed cost of $\frac{1}{8}$ if it produces positive output (otherwise, its costs are zero). Once the fixed cost is paid it costs each firm zero to produce each additional unit i.e. variable costs are zero. Find the pure strategy Nash equilibrium of this game.

(b) Explain the following concepts :

(i) Complete information

(ii) Perfect information (10)+(2.5+2.5)=15