BACHELOR OF ARTS EXAMINATION, 2024

(3rd Year, 1st Semester)

ECONOMICS

PAPER : DSE 5.2/3

(Topics in Microeconomics—I)

Time : *Two Hours*   *Full Marks* : 30

Answer the following questions as directed.

The figures in the margin indicate full marks.

GROUP—A

Answer *any four* questions :   5×4=20

1. Suppose that two neighbours are attempting to determine which volume level to set their speakers during Diwali celebration. Neighbour 1 has 3 choices for speaker volume : High, Medium or Low. Neighbour 2 observes (or rather, hears) Neighbour 1's choice of speaker volume and then gets to choose whether or not to set his speaker volume to High, Medium, or Low. The payoffs to the neighbours are as follows : If both listen to their music at a low volume, then both receive a payoff of 10. If both listen to their music at a medium volume, then both receive a payoff of 6. If both listen to their music at a high volume, then both receive a payoff of 2. If one neighbour listens to his music at a medium volume while the

other listens at a low volume, the payoff is 12 for the medium volume listener and 5 for the low volume listener. If one neighbour listens to his music at a high volume while the other listens at a medium volume, the payoff is 8 for the high volume listener and 1 for the medium volume listener. Finally, if one player listens to his music at a high volume and the other listens to his music at a low volume, the payoff is 15 for the high volume listener and (–1) for the low volume listener. Draw the extensive form of the game and from the diagram, find the sub-game perfect Nash equilibrium.   4+1

2.   Find the rationalizable strategies, then find mixed strategy Nash equilibrium of the following game :   1+4

		Son		
Mother		Seek work seriously	Seek work reluctantly	Lazy
	Helps regularly	3,2	1.5,1.5	−1,3
	Helps sometimes	2,1.5	1,1	−1.5,2.5
	Never helps	−1,1	−1,0.5	0,0

The cost of exerting effort given by ith player is

$$c_i = \frac{1}{2}e_i^2 .$$

In the second stage, once e_1 and e_2 have been chosen, the two partners agree to share the gains π as follows. They flip a coin and if the result is heads, Partner 1 proposes a division of the gains between him and Partner 2. The latter must decide whether to accept or reject that division. If Player 2 rejects, the game ends and both partners earn zero. If tails, the allocation procedure is the same but Partner 2 will be the one proposing the division of gains. Find all the subgame perfect equilibria of the game. Specify your results in terms of the strategies of each of the players.   5

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(6)

Suppose Player 2 uses a strategy of "*Choose Centre unless a defection occurs by Player 1, where a defection by Player 1 is a choice of Up or Down in even periods or Up or Middle in odd periods. If a defection is observed, choose Left forever regardless of what Player 1 chooses after the defection*".

Find the minimum discount rate, needed for each player to support these strategies as a SPNE to the infinitely repeated game. 4

2. (a) Suppose f is a public good. Utility for A and B are preferences to $u_1 = c_1 + k \ln(1+f)$ where $k > 1$ and $u_2 = c_2 + \ln(1+f)$, where $f = f_1 + f_2$ and c_i is the consumption of private good.

Each faces budget constraint of $c_i + pf_i = M_i$, where M_is are money income.

Find and draw the best response function of each person and determine Nash equilibrium level of f_1 and f_2. Critically explain your answer. 5

(b) Consider the following effort-negotiation game between two partners in a joint project X. In the first stage, partners 1 and 2 must choose simultaneously the effort level, $e_i \in [0, \infty)$ for $i = 1, 2$, to exert in the joint project X. Gains from project X are :

$$\pi = e_1 + e_2 + e_1 e_2$$

ECO-**57**   [*Turn Over*]

(3)

3. Consider the following game-theoretic model of the equilibrium determination of the cleanliness (and effort distribution) of an apartment shared by two roommates. In the game, the two roommates simultaneously choose the effort, e_1 and e_2, to spend on apartment cleaning. They each get utility from the cleanliness of the apartment (which is a function of the sum of the efforts) and disutility from the effort they personally expend. Player 1 places a higher valuation on cleanliness. Specifically, assume that e_1 and e_2, are chosen from the set of non-negative real numbers and that

$$u_1 = k \log(e_1 + e_2) - e_1$$

$$u_2 = \log(e_1 + e_2) - e_2$$

Find pure strategy Nash equilibrium of this game. Compare it with the case where Player 1 chooses first and Player 2 follows. 3+2

4. Explain why in second price sealed bid auction with n players, each player will always bid according to his true valuation. 5

5. Consider the four-period, alternating-offer bargaining game over an object with valuation 1. Each player uses a discount factor $\delta_i \in (0,1)$ for $i = 1, 2$ between periods. In period one, A makes an offer. If rejected, B makes a counter offer in period two. If rejected, A makes an offer in period three. If rejected, B makes a counter offer in period four. If the game reaches the fourth period and if the period four counter offer is rejected, the game ends and each player earns zero utility. Calculate the unique subgame-perfect equilibrium by backward induction. 5

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(4)

6. A firm's production function is given by

$Q(L) = L(100 - L)$ if $L < 50$ and $Q(L) = 2500$ if $L > 50$,

where L is the number of workers. The price of output is 1. A union that represents workers presents a wage demand (a non-negative real number w), which the firm either accepts or rejects. If the firm accepts the demand, it chooses L (a non-negative real number, not necessarily an integer); if it rejects the demand, no production takes place ($L = 0$). The firm's preferences are represented by its profit whereas the union's preferences are represented by the total wage bill, wL.

(a) Find the subgame perfect equilibria of the above game.

(b) What is the socially optimal outcome of this game? What is the maximum joint surplus of this game? 5

GROUP—B

Answer **any one** question from the following : 10×1=10

1. Consider the following simultaneous game which is infinitely repeated :

	Left	Centre	Right
Up	5, 6	8, 1	10, 4
Middle	2, 11	6, 9	4, 2
Down	3, 8	7, 7	6, 0

(5)

(a) If the game is repeated 29 times, what will be the subgame perfect Nash equilibrium? 2

(b) Now suppose that this game is infinitely repeated. Suppose Player 1 uses a strategy of "*Choose Middle unless a defection occurs by Player* 2, *where a defection is Player* 2 *choosing either Left or Right. If a defection is observed, choose Up forever regardless of what Player* 2 *chooses after the defection*".

Suppose Player 2 uses a strategy of "*Choose Centre unless a defection occurs by Player* 1, *where a defection by Player* 1 *is a choice of Up or Down. If a defection is observed, choose Left forever regardless of what Player* 1 *chooses after the defection*".

Find the minimum discount rate, needed for each player to support these strategies as a SPNE to the infinitely repeated game. 4

(c) Suppose that Player 1 uses the following strategy :

"*Choose Middle in even periods and Down in odd periods unless a defection occurs by Player* 2, *where a defection is Player* 2 *choosing either Left or Right. If a defection is observed, choose Up forever regardless of what Player* 2 *chooses after the defection.*"