

This question paper contains 16 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 6019

Unique Paper Code : 227401

G

Name of the Paper : Intermediate Microeconomics—II

Name of the Course : B.A. (Hons.) Economics

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Note :— Answers may be written *either* in English *or* in Hindi; but the same medium should be used throughout the paper.

टिप्पणी : इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिन्दी किसी एक भाषा में दीजिए; लेकिन सभी उत्तरों का माध्यम एक ही होना चाहिए।

All questions carry equal marks.

Attempt any *three* from Section A and any *two* from Section B.

Use of simple calculator is allowed.

P.T.O.

सभी प्रश्नों के अंक समान हैं।

तीन प्रश्नों का उत्तर खण्ड-अ से दो प्रश्नों

का उत्तर खण्ड-ब से दीजिए।

साधारण कैलकुलेटर का प्रयोग मान्य है।

Section A

(खण्ड-अ)

- ✓ 1. (a) What is a fair allocation ? Is an equal distribution fair ? Why or why not ?
- (b) In a 2×2 pure exchange economy the two agents A and B have the following ordinal utility functions :

$$U_A = \min(X_A, 6Y_A)$$

$$U_B = X_B^{3/4} Y_B^{1/4}$$

- (i) Given that this two person economy is endowed with 240 units of X and 40 units of Y, draw the Edgeworth Box and find the set of Pareto efficient allocations.

- (ii) Agent A has an initial endowment of 240 units of X but no Y and B has an endowment of 40 units of Y but no X. If competitive exchange takes place between A and B, find the general equilibrium price ratio and allocation.
- (iii) Can you tell whether this allocation is fair ?

5+10

- (अ) न्याय संगत आबंटन क्या है ? क्या समान वितरण न्याय संगत है ? क्यों अथवा क्यों नहीं ?
- (ब) एक 2×2 शुद्ध विनियमन अर्थव्यवस्था में दो एजेंटों A और B के निम्नलिखित क्रमवाचक उपयोगिता फलन हैं :

$$U_A = \min(X_A, 6Y_A)$$

$$U_B = X_B^{3/4} Y_B^{1/4}$$

- (i) दिया गया है कि इस दो व्यक्ति अर्थव्यवस्था में X की 240 इकाइयों तथा Y की 40 इकाइयों की संचित निधि है, तो एजवर्थ बॉक्स को दर्शाइए तथा पैरेटो कुशल आबंटनों के समूह को ज्ञात कीजिए।

(ii) एजेंट A के पास X की 240 इकाइयों की प्रारम्भिक संचित निधि है लेकिन Y की नहीं है तथा B के पास Y की 40 इकाइयों की संचित निधि है लेकिन X की नहीं है। यदि प्रतियोगी विनिमय दोनों के बीच होता है तो सामान्य संतुलन कीमत अनुपात तथा आबंटन को ज्ञात कीजिए।

(iii) क्या आप कह सकते हैं कि यह आबंटन न्याय संगत है ?

2. (a) Suppose there is a newspaper firm polluting the nearby field with dyes, thereby adversely affecting the farmer by increasing his cost of production. Their cost functions are $C(N) = N^2 + 2$ and $C(F) = F^2 + NF$ for the newspaper and the farmer respectively. N is output of the newspaper firm, F is output of the farmer. Both sell their product in competitive markets with $P_N = 5$ and $P_F = 4$.

(i) Find their outputs if both maximize private profits.

(ii) Find the socially efficient levels of outputs.

(iii) How much tax should be imposed per unit of output, on the newspaper firm in order to induce the efficient outcome ?

(b) Explain with an example, the Moral Hazard problem that arises in the Insurance Industry. 9+6

(अ) मान लीजिए कि एक अखबार फर्म निकट के खेत को रंगों द्वारा प्रदूषित कर रहा है अन्ततः यह फर्म निकट के किसान की उत्पादन की लागत को बढ़ा रहा है। इनके लागत फलन हैं

अखबार फर्म $C(N) = N^2 + 2$ $N =$ अखबार फर्म का उत्पादन है।

किसान $C(F) = F^2 + NF$ $F =$ किसान का उत्पादन है।

दोनों अपने उत्पाद को प्रतियोगी बाजारों में $P_N = 5$ और $P_F = 4$ कीमतों पर बेचते हैं।

(i) इनके उत्पादों को ज्ञात कीजिए यदि दोनों निजी लाभों को अधिकतम करते हैं।

(ii) उत्पादों के सामाजिक कुशल स्तरों को ज्ञात कीजिए।

(iii) अखबार फर्म पर, कुशल प्रतिफल को प्रेरित करने के लिए, उसके उत्पाद पर प्रति इकाई कितना कर लगाया जाना चाहिए ?

(ब) उदाहरण के साथ नैतिक जोखिम (Moral Hazard) समस्या का विश्लेषण कीजिए, जो बीमा उद्योग में उत्पन्न होती है।

3. (a) In a 2×2 pure exchange economy, the two consumers A and B (Who consume two goods X and Y) have utility functions given by :

$$U_A(X_A, Y_A) = X_A^2 + Y_A^2$$

$$U_B(X_B, Y_B) = X_B^2 + Y_B^2$$

If the total endowments of X and Y in the economy are 400 units each, draw the Edgeworth Box and show the Pareto efficient allocations of this economy in the Box.

- (b) For a 2×2 pure exchange economy, the two consumers A and B have the following utility functions :

$$U_A(X_A, Y_A) = X_A^{1/2} + Y_A^{1/2}$$

$$U_B(X_B, Y_B) = X_B^{1/2} + Y_B^{1/2}$$

Their endowments are $W_A = (200, 200)$ and

$$W_B = (200, 200)$$

- (i) What will be the shape of the consumption contract curve ? Show in a diagram.
- (ii) What will be the general equilibrium price ratio at any competitive equilibrium ?

7+8

(अ) 2×2 शुद्ध विनिमय अर्थव्यवस्था में दो उपभोक्ता A और B (जो दो वस्तुओं X और Y का उपभोग करते हैं) के उपयोगिता फलन निम्न रूप में दिए गये हैं :

$$U_A(X_A, Y_A) = X_A^2 + Y_A^2$$

$$U_B(X_B, Y_B) = X_B^2 + Y_B^2$$

यदि अर्थव्यवस्था में X और Y की कुल संचित निधि प्रत्येक वस्तु की 400 इकाइयाँ हैं तो एजवर्थ बॉक्स रेखांकित कीजिए तथा इस अर्थव्यवस्था के पैरोटो कुशल आबंटन को इस बॉक्स में दिखाइये।

(ब) 2×2 शुद्ध विनिमय अर्थव्यवस्था में दो उपभोक्ता A और B के निम्नलिखित उपयोगिता फलन हैं :

$$U_A(X_A, Y_A) = X_A^{1/2} + Y_A^{1/2}$$

$$U_B(X_B, Y_B) = X_B^{1/2} + Y_B^{1/2}$$

इनकी संचित निधि $W_A = (200, 200)$ और $W_B = (200, 200)$ है

- (i) खपत अनुबंध वक्र का आकार कैसा होगा ? दर्शाइए।
- (ii) किसी भी प्रतियोगी संतुलन पर सामान्य संतुलन कीमत अनुपात क्या होगा ?

4. (a) If X is a public good for two consumers A and B with demand curves $X_A = 18 - 3P_X$ and $X_B = 15 - \frac{3}{2}P_X$. What is the Pareto efficient amount of X to produce if the marginal cost of producing X is given by $MC_X = X$?

(b) Suppose that 15 people live on a street and each of them is willing to pay Rs. 4 for an extra streetlight regardless of the number of streetlights provided. If the cost of providing x streetlights is $C(x) = x^2$ then what is the Pareto efficient number of streetlights to provide ?

(c) Briefly explain the free rider problem. 5+5+5

(अ) यदि दो उपभोक्ता A और B के क्रमशः माँग वक्र $X_A = 18 - 3P_X$ और $X_B = 15 - \frac{3}{2}P_X$ हैं और इनके लिए X एक सार्वजनिक वस्तु है, तो उत्पादन करने के लिए X की पैरेटो कुशल मात्रा क्या है जबकि X का उत्पादन करने के लिए सीमांत लागत $MC_X = X$ दिया गया है ?

(ब) मान लीजिए कि 15 व्यक्ति एक गली में रहते हैं और उनमें से प्रत्येक व्यक्ति प्रत्येक अतिरिक्त स्ट्रीटलाइट के लिए 4 रुपयों का भुगतान करने के लिए तैयार है (चाहे जितनी भी स्ट्रीटलाइट उपलब्ध की गई हों) यदि x अवस्थित

स्ट्रीटलाइट की लागत $C(x) = x^2$ है तो स्ट्रीटलाइट की पैरेटो कुशल संख्या क्या है ?

(स) संक्षिप्त रूप में मुफ्तखोर (Free rider) समस्या का विश्लेषण कीजिए।

Section B

(खण्ड-ब)

5. (a) The market demand curve for X is the constant price elasticity demand curve $Q = P^{-2}$. X can be produced at a constant average and marginal cost $AC = MC = C$.
- (i) What will be the competitive price of X ?
- (ii) What will be the monopoly price ?
- (iii) What part of competitive consumers surplus gets transferred to monopoly profits ?
- (iv) What fraction of consumer's surplus under perfect competition is lost altogether if the market is served by a monopoly with the same costs ?

- (b) A monopolist serves two consumers with demand functions given by :

$$Q_1 = 10 - P_1 \text{ and}$$

$$Q_2 = 8 - P_2$$

he has constant average and marginal cost = 2

- (i) What is the Oi tariff in this case ?
- (ii) What is the optimal linear two part tariff ?
- (iii) What price per unit do the two demanders pay when he charges this tariff ? 6+9

(अ) X के लिए बाजार मांग वक्र स्थिर कीमत लोच मांग वक्र $Q = P^{-2}$ है और X को स्थिर औसत तथा सीमांत लागत पर उत्पादित किया जा सकता है $AC = MC = C$.

- (i) X की प्रतियोगी कीमत क्या होगी ?
- (ii) एकाधिकारी कीमत क्या होगी ?

- (iii) प्रतियोगी उपभोक्ता बचत का कितना भाग एकाधिकारी लाभ के रूप में हस्तांतरित हो जाएगा ?
- (iv) यदि यह बाजार समान लागत के साथ एक एकाधिकार द्वारा चलाया जाता है तो पूर्ण प्रतियोगिता के अन्तर्गत उपभोक्ता बचत का कौनसा हिस्सा पूरी तरह से खो दिया जाएगा ?

(ब) एक एकाधिकारी दो उपभोक्ताओं की सेवा करता है जिनके माँग फलन हैं :

$$Q_1 = 10 - P_1 \text{ और}$$

$$Q_2 = 8 - P_2$$

उसकी स्थिर औसत तथा सीमांत लागत 2 है

- (i) इस स्थिति में O_i प्रशुल्क क्या है ?
- (ii) अनुकूलतम रेखीय दो भाग प्रशुल्क क्या होगा ?
- (iii) दोनों उपभोक्ता प्रति इकाई कितनी कीमत का भुगतान करेंगे जब वह इस प्रशुल्क को लागू करता है ?

6. (a) In a duopoly two firms can pursue either of two strategies, Aggressive (A) and Passive (P). Their Pay-offs from pursuing these are as given below :

		2	
		A	P
1	A	25, 9	33, 10
	P	30, 13	36, 12

- (i) What is the Nash equilibrium of this simultaneous game ? Explain.
- (ii) If the game is a sequential one with player 1 moving first would a threat by player 2 to play A regardless of what player 1 does be a credible threat ?
- (iii) What would be the subgame perfect Nash equilibrium of this sequential game ? Explain using the extensive form.
- (b) Briefly explain the "Battle of the Sexes" game. 9+6

(अ) एक द्वधिकार में दो फर्मों के पास दो रणनीतियाँ हैं, आक्रमणकारी (A) और स्थिर (Passive) (P) जिनका वे प्रयोग कर सकते हैं। इन रणनीतियों के जारी रखने का मुद्रा भुगतान निम्न हैं :

		2	
		A	P
1	A	25, 9	33, 10
	P	30, 13	36, 12

- (i) इस समकालीन खेल के नैश संतुलन क्या हैं ? विवेचन कीजिए।
- (ii) यदि खेल एक अनुक्रमिक खेल है और खिलाड़ी 1 पहले चाल चलता है तो खिलाड़ी 2 द्वारा हर हाल में (चाहे खिलाड़ी 1 कोई भी चाल चले) A चलने की धमकी एक साखपूर्ण धमकी होगी ?
- (iii) इस अनुक्रमिक खेल के उपखेल-पूर्ण नैश संतुलन (Subgame Perfect Nash Equilibrium) क्या होगा ? विस्तृत रूप का उपयोग करते हुए विश्लेषण कीजिए।

(ब) संक्षिप्त रूप में "लिंगों के युद्ध" (Battle of the Sexes) खेल का विश्लेषण कीजिए।

7. (a) In the Stackelberg model if the Inverse demand function is given by $P = a - Q$ and both firms have zero production costs. What would be :

(i) The equilibrium outputs of the leader (Firm 1) and the follower (Firm 2).

(ii) The price charged.

(iii) Profits of both firms.

(b) A market is served by two Cournot duopolists. The Inverse demand function is $P = 600 - 2Q$. Both firms have constant average and marginal cost equal to 180. Derive and graph their best response functions. Find the Cournot equilibrium quantities, the price charged and the profits of both firms make.

6+9

P.T.O.

(अ) स्टैकलबर्ग मॉडल में यदि प्रतिलोम मांग फलन $P = a - Q$ दिया गया है। तथा दोनों फर्मों की उत्पादन लागत शून्य है तो :

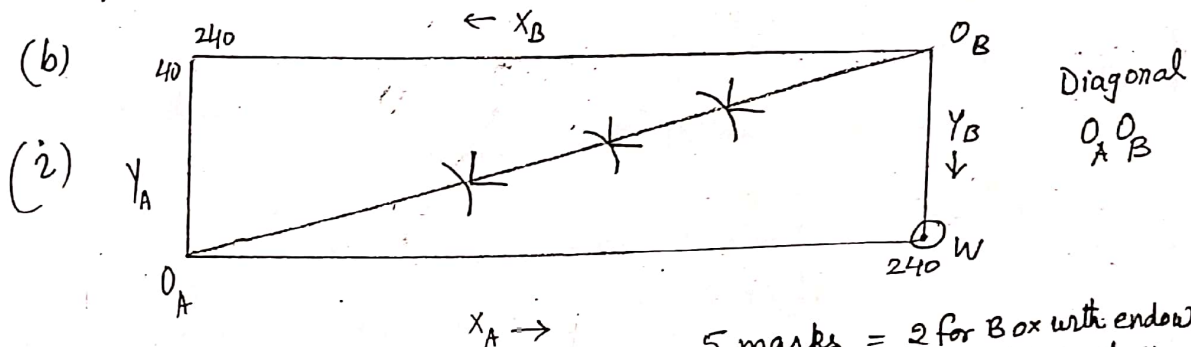
(i) नेतृत्व फर्म (1) तथा अनुकरणकर्ता फर्म (2) का संतुलन उत्पादन क्या होगा ?

(ii) वस्तु की कीमत क्या होगी ?

(iii) दोनों फर्मों का लाभ कितना होगा ?

(ब) एक बाजार दो कूर्नों द्वधिकारियों द्वारा चलाया जाता है। प्रतिलोम मांग फलन $P = 600 - 2Q$ दिया गया है। दोनों फर्मों का स्थिर औसत तथा सीमांत लागत समान 180 है। उनके उत्तम उत्तरदायी फलनों को निर्धारित कीजिए और ग्राफ द्वारा दर्शाइए। कूर्नों संतुलन उत्पादन मात्राओं, वस्तु की कीमत तथा दोनों फर्मों के लाभ को ज्ञात कीजिए।

1(a) Fair allocation is both efficient and equitable (i.e. no agent envies the other). 3 marks (give only 2 marks if not explain what efficient-equitable means)
 An equal distribution is equitable but may or may not be Pareto-efficient so it may or may not be fair. → 2 marks



5 marks = 2 for Box with endowments + 3 for diagonal as locus of Pareto effect

(ii) $U_A = \min(X_A, 6Y_A)$

→ $X_A = 6Y_A$

$P_X X_A + P_Y Y_A = 240 P_X$

$P_X 6Y_A + P_Y Y_A = 240 P_X$

if $P_X = 1$ then $Y_A (6 + P_Y) = 240$

$Y_A^* = \frac{240}{6 + P_Y}$

Also fine

if $P_Y = 1$ is taken

& then calculations leading to $P_X = \frac{1}{2}$

$U_B = X_B^{3/4} Y_B^{1/4}$

$Y_B^* = \frac{1}{4} \times \frac{M_B}{P_Y} = \frac{1}{4} \times \frac{40 P_Y}{P_Y} = 10$

3 marks

$Y_A^* + Y_B^* = 40 \Rightarrow \frac{240}{6 + P_Y} = 30 \Rightarrow P_Y = 2$

$\therefore \frac{P_X}{P_Y} = \frac{1}{2}$

$Y_B^* = 10 \quad Y_A^* = 30 \quad \therefore X_A^* = 6 \times 30 = 180$
 $X_B^* = 240 - 180 = 60$

Also give full marks if some market clearing equations for X is stated even if it doesn't reach the value of P_X/P_Y . MKT clearing eqn can be stated as $30 P_Y/P_X + \frac{240 P_X}{P_X + P_Y/6} = 240$ or its equivalent

(iii) Not fair allocation as B will envy A because A consumes more of both goods X and Y

2 marks (only 1 mark if just stated not fair without reason)

2 (a)

(i) $MP_{bc} = \text{Price Newspaper}$
 $2N = 5$
 $\hat{N} = 2.5$

Farmer
 $2F + N = 4$
 $2F + 2.5 = 4$
 $\hat{F} = 0.75$

3 marks

(ii) socially efficient

$$\pi_{\text{joint}} = 5N + 4F - N^2 - 2 - F^2 - NF$$

$$\frac{\partial \pi_{\text{joint}}}{\partial N} = 0 \quad \frac{\partial \pi_{\text{joint}}}{\partial F} = 0$$

$$\Rightarrow N^* = 2 \text{ and } F^* = 1$$

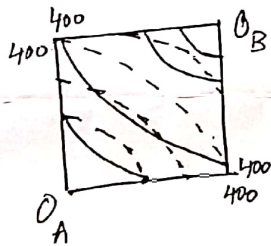
3 marks

(iii) tax: $MP_{bc} + \text{tax} = \text{Price}$
 $2N^* + t = 5$
 $4 + t = 5$
 $t = 1$

3 marks

(b) Moral Hazard in Insurance Industry (6 marks)
 (As in recommended text)

3 (a)



$$MRS_{xy}^{(A)} = \frac{X_A}{Y_A}$$

$$MRS_{xy}^B = \frac{X_B}{Y_B}$$

\therefore Concave ICs

Pareto efficient = all edges
 Can give full marks for completely correct Edgeworth box diagram also (with ICs)
 But if they say P-Efficient is diagonal then deduct 1 mark

7 marks:
 = 5 for Box
 + 2 for Pareto efficient

(b) $MRS_{xy}^A = \frac{\sqrt{Y_A}}{\sqrt{X_A}}$

$$MRS_{xy}^B = \frac{\sqrt{Y_B}}{\sqrt{X_B}}$$

both ICs convex

Pareto efficient points

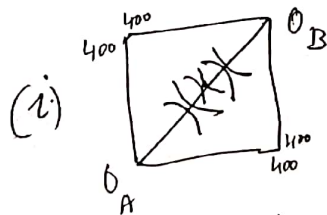
$$\frac{\sqrt{Y_A}}{\sqrt{X_A}} = \frac{\sqrt{Y_B}}{\sqrt{X_B}} \quad \therefore \frac{Y_A}{X_A} = \frac{Y_B}{X_B}$$

$$\therefore \frac{400 - Y_B}{400 - X_B} = \frac{Y_B}{X_B}$$

$$\Rightarrow 400X_B - Y_B X_B = 400Y_B - Y_B X_B$$

$$X_B = Y_B$$

$$X_A = Y_A$$



Contract curve (ii) $\frac{P_x}{P_y} = 1 \Rightarrow$ 4 marks with working.

4 marks if fully derived
 only 3 marks if correct diagram with diagonal stated and drawn as contract curve without deriving.

we only 2 marks if they have just stated $P_x/P_y = MRS_{xy}$

4 (a)

(A)

$$X_A = 18 - 3P_X$$

$$3P_X = 18 - X_A$$

$$P_X = 6 - \frac{X_A}{3}$$

$$X_B = 15 - \frac{3}{2}P_X$$

$$\frac{3}{2}P_X = 15 - X_B$$

$$P_X = 10 - \frac{2}{3}X_B$$

Public good $\Rightarrow X_A = X_B = X$

$$\begin{aligned} \therefore \text{Benefit} &= 6 - \frac{X}{3} + 10 - \frac{2}{3}X \\ &= 16 - X \end{aligned}$$

$$MC_X = X$$

$$\Rightarrow 16 - X = X \quad \text{for Pareto optimal}$$

$$2X = 16$$

$$X^* = 8$$

Give full 5 marks for this or any other answer is when Qn 4 is attempted

(b) Cost of providing X streetlights is X^2

$$\therefore MC = 2X$$

15 people, each values at 4

$$\therefore 15 \times 4 = 60$$

$$60 = 2X$$

$$X = 30$$

(Pareto efficient) number of streetlights

for condition

$$5 \text{ marks} = 2 + 3$$

for $X=30$

(c) Free rider problem as in textbook. 5 marks

(5) (i) competitive price of $X = C$

(ii) monopoly price = $2C$ since $Q = P^{-2}$

$$\therefore TR = Q^{1/2} \Rightarrow MR = \frac{1}{2\sqrt{Q}} \Rightarrow \frac{1}{2\sqrt{Q}} = C \quad (MC = AC = C)$$

$$Q = \frac{1}{4C^2} \quad P = 2C$$

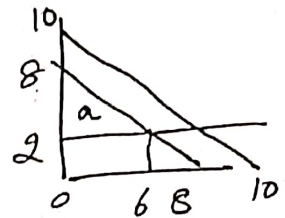
(iii) $\frac{\pi_m}{CS_c} = \left(\frac{e}{1+e}\right)^e$ at $e = -2$ $\frac{\pi_m}{CS_c} = \frac{1}{4}$

(iv) either via $\frac{CS_m}{CS_c} = \frac{1}{(1+1/e)^{e+1}}$ and at $e = -2$ $\frac{CS_m}{CS_c} = \frac{1}{2}$

$$\therefore \frac{DWL}{CS_c} = 1 - \frac{1}{2} - \frac{1}{4} = \frac{1}{4} \quad \text{or directly or diagram}$$

5 (b) Given $Q_1 = 10 - P$, and $Q_2 = 8 - P_2$

(2) 0i tariff is $T(q) = 18 + 2q$

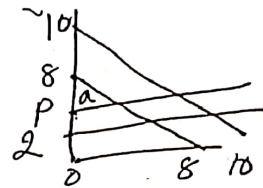


3 marks as $a = \text{entry fee} = \frac{1}{2}(8-2)(8-2) = 18$

(only 1 if only formula given) $P = \text{usage fee} = 2$

(ii) optimal linear two part tariff is

3 marks $T(q) = 12.5 + 3q$



(only 1 mark if only formula) $\Pi = 2a + (P - MC)(Q_1 + Q_2)$

$\Pi = 2 \times \frac{1}{2} (8-P)(8-P) + (P-2)(18-2P)$

$\Pi = 28 + 6P - P^2$

$\frac{\partial \Pi}{\partial P} = 6 - 2P = 0 \Rightarrow P^* = 3$

$\therefore a = \frac{1}{2} \times (8-3)(8-3) = 12.5$

(iii) at $P^* = 3$ $Q_1 = 7$
 $Q_2 = 5$

3 marks

(No marks to be cut for minor calculation error)

price per unit for 1 is $\frac{(7 \times 3) + 12.5}{7} = 4.78$

price per unit for 2 is $\frac{(5 \times 3) + 12.5}{5} = 5.5$

6(a)(i) Nash eqm is (P, A) with payoffs $(30, 13)$

3 marks

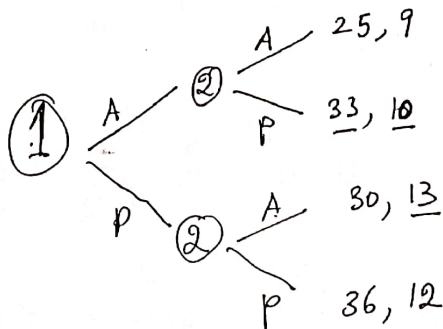
3 marks (ii)

and (iii)

No, playing A regardless of what player 1 does, is not a credible threat.

3 marks

(only 1 mark if only correct game tree is done)



SPNE is

1 plays A
and 2 plays P/A and A/P
with payoffs 33, 10

(b) Battle of the sexes as explained in either of the recommended textbooks.

6 marks

7(a) $P = a - Q$

$P = a - Q_1 - Q_2$

$\pi_1 = aQ_1 - Q_1^2 - Q_2Q_1$ Profit function of the leader

$\pi_2 = aQ_2 - Q_1Q_2 - Q_2^2$

$\frac{\partial \pi_2}{\partial Q_2} = a - Q_1 - 2Q_2 = 0$

$Q_2 = \frac{a - Q_1}{2}$ BRF of follower

$\pi_1 = aQ_1 - Q_1^2 - Q_1 \left(\frac{a - Q_1}{2} \right)$

$\pi_1 = aQ_1 - Q_1^2 - \frac{aQ_1}{2} + \frac{Q_1^2}{2}$

$\frac{\partial \pi_1}{\partial Q_1} = a - 2Q_1 - \frac{a}{2} + Q_1$

$\frac{\partial \pi_1}{\partial Q_1} = \frac{a}{2} - Q_1 = 0$

$\Rightarrow Q_1^* = \frac{a}{2} \quad Q_2^* = \frac{a - \frac{a}{2}}{2} = \frac{a}{4} \rightarrow 2 \text{ marks}$

$\therefore P^* = a - \frac{a}{2} - \frac{a}{4} \Rightarrow P^* = \frac{a}{4} \rightarrow 2 \text{ marks}$

$\pi_1^* = \frac{a^2}{8}, \pi_2^* = \frac{a^2}{16} \rightarrow 2 \text{ marks}$

(b) $P = 600 - 2Q \quad MC = 180 = AC$

$P = 600 - 2Q_1 - 2Q_2$

$\pi_1 = 600Q_1 - 2Q_1^2 - 2Q_2Q_1 - 180Q_1$

$\frac{\partial \pi_1}{\partial Q_1} = 600 - 4Q_1 - 2Q_2 - 180 = 0$

$\Rightarrow 4Q_1 = 420 - 2Q_2$

$Q_1 = 105 - \frac{1}{2}Q_2$ - BRF of 1. $\rightarrow 2 \text{ marks}$

iii) $Q_2 = 105 - \frac{1}{2}Q_1$ - BRF of 2 $\rightarrow 2 \text{ marks}$

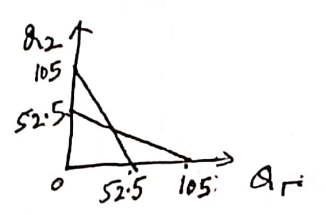
$Q_1^* = 105 - \frac{1}{2} \left(105 - \frac{1}{2}Q_1^* \right)$

$Q_1^* = 52.5 + \frac{1}{4}Q_1^*$

$\frac{3}{4}Q_1^* = 52.5 \Rightarrow Q_1^* = 70, Q_2^* = 70, P^* = 320$

$\frac{1}{\text{mark}} \quad \frac{1}{\text{mark}} \quad \frac{1}{\text{mark}}$

Total = 9 marks



$\pi_1^* = \pi_2^* = \frac{(320 - 180) \cdot 70}{2} = 9800 \rightarrow 2 \text{ marks}$

This question paper contains 32 printed pages]

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--

S. No. of Question Paper : 9190

Unique Paper Code : 12271401

GC

Name of the Paper : Intermediate Microeconomics—II

Name of the Course : B.A. (Hons.) Economics

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

(इस प्रश्न-पत्र के मिलते ही ऊपर दिए गए निर्धारित स्थान पर अपना अनुक्रमांक लिखिए ।)

Note :— Answers may be written *either* in English *or* in Hindi; but the same medium should be used throughout the paper.

टिप्पणी : इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिन्दी किसी एक भाषा में दीजिए; लेकिन सभी उत्तरों का माध्यम एक ही होना चाहिए ।

The question paper is divided into *two* sections.

Attempt *four* questions in all, selecting *two* questions

from Section A and *two* from Section B.

Use of simple calculator is permitted.

P.T.O.

यह प्रश्न-पत्र दो खण्डों में विभाजित है ।

कुल मिलाकर चार प्रश्न करने हैं ।

दो प्रश्न खण्ड 'अ' से तथा दो प्रश्न खण्ड 'ब' से ।

साधारण कैलकुलेटर के प्रयोग की अनुमति है ।

Section A

(खण्ड 'अ')

1. (a) Two consumers A and B consume two goods X and Y in an exchange economy and their preferences are given by :

$$U_A = X_A + \sqrt{Y_A} \quad \text{and} \quad U_B = X_B + \sqrt{Y_B}$$

where X_A , Y_A , X_B , Y_B are the consumption of X and Y by consumers A and B respectively. Endowment is given as :

$$W_{XA} + W_{XB} = 16 \quad \text{and}$$

$$W_{YA} + W_{YB} = 16,$$

where W_{XA} , W_{XB} , W_{YA} , W_{YB} is the endowment of good X and Y to consumer A and B.

- (i) What is the set of Pareto efficient allocations in this 2×2 exchange economy ?
- (ii) Show the Pareto efficient allocations in an Edgeworth box diagram.
- (iii) If $W_{XA} = 12$ and $W_{YA} = 4$, then find the general equilibrium price ratio and allocation if consumer A and B trade good X and Y competitively.

दो उपभोक्ता A तथा B विनिमय अर्थव्यवस्था में दो वस्तुओं X तथा Y का उपभोग करते हैं तथा उनकी प्राथमिकताएँ :

$$U_A = X_A + \sqrt{Y_A} \quad \text{तथा} \quad U_B = X_B + \sqrt{Y_B}$$

द्वारा दर्शायी गयी है । जहाँ X_A , Y_A , X_B , Y_B उपभोक्ता A तथा B द्वारा क्रमशः X तथा Y वस्तुओं का उपभोग है ।

$$W_{XA} + W_{XB} = 16$$

$$W_{YA} + W_{YB} = 16$$

संचित निधि को प्रदर्शित करती है जहाँ W_{XA} , W_{XB} , W_{YA} , W_{YB} क्रमशः उपभोक्ता A तथा B की दो वस्तुओं X तथा Y की संचित निधि है ।

- (i) इस 2×2 विनिमय अर्थव्यवस्था में पेरेटो कुशल आबंटन क्या है ?
- (ii) पेरेटो कुशल आबंटन को एजवर्थ बॉक्स रेखाचित्र में दर्शाइए ।
- (iii) यदि $W_{XA} = 12$ तथा $W_{YA} = 4$, है, तो सामान्य संतुलन कीमत अनुपात तथा आबंटन ज्ञात कीजिए यदि उपभोक्ता A तथा B वस्तुओं X तथा Y का प्रतियोगी व्यापार करते हैं ।

- (b) Assume that there are three agents in an economy and that social preferences are decided by pair-wise majority voting. List of rankings for three alternatives,

m , n and p is given in table below :

Person A	Person B	Person C
m	n	p
n	p	m
p	m	n

- (i) Set a voting agenda that result in allocation ' n ' winning.
- (ii) Also find an agenda that has ' p ' winning.
- (iii) Do you agree that pair-wise majority voting can be manipulated by changing the order in which votes are taken to yield the desired outcome ?

Explain.

9.5+9

मान लीजिए कि एक अर्थव्यवस्था में तीन एजेंट हैं और जोड़ी संबंधी बहुमत वोटिंग द्वारा सामाजिक प्राथमिकताएँ तय की जाती हैं । तीन विकल्पों m ,

n तथा p की क्रम अनुसार सूची नीचे तालिका में दी गई है :

व्यक्ति A	व्यक्ति B	व्यक्ति C
m	n	p
n	p	m
p	m	n

- (i) एक वोटिंग कार्यावली निर्धारित कीजिए जो कि 'n' के जीतने में परिणामित होती है ।
- (ii) उस कार्यावली को भी ज्ञात कीजिए जिसमें 'p' जीतता है ।
- (iii) क्या आप इस बात से सहमत हैं कि जोड़ी-वार मतदान का क्रम बदलकर हम चालाकी से वांछित परिणाम प्राप्त कर सकते हैं ? समझाइए ।

2. (a) In a pure exchange economy with two goods (X and Y) and the two consumers A and B who have ordinal utility function given by :

$$U_A = X_A + Y_A \text{ and}$$

$$U_B = X_B Y_B,$$

and their endowments are given as (0, 50) and (50, 0) respectively.

- (i) Draw the Edgeworth box for this economy and identify the endowment point.
- (ii) Will competitive exchange between them lead to an equilibrium (where both consumers consumes positive amounts of both goods) that is :
- (a) Efficient
- (b) Equitable
- (c) Fair.

Give Explanations.

एक शुद्ध विनिमय अर्थव्यवस्था में दो वस्तुएँ (X तथा Y) और दो उपभोक्ता A तथा B हैं जिनका क्रमिक उपयोगिता

फलन :

$$U_A = X_A + Y_A \text{ तथा}$$

$$U_B = X_B Y_B$$

है, तथा उनकी स्थायी निधि क्रमशः (0, 50) तथा (50, 0) है ।

(i) इस अर्थव्यवस्था के लिए एजवर्थ बॉक्स को आरेखित कीजिए तथा स्थाई निधि बिंदु को पहचानिए ।

(ii) क्या उन दोनों के बीच प्रतिस्पर्धी आदान-प्रदान, एक ऐसे संतुलन की ओर बढ़ेगा, जहाँ दोनों उपभोक्ता दोनों वस्तुओं की सकारात्मक राशि का सेवन करते हैं तथा यह संतुलन :

(a) कुशल

(b) समान

(c) निष्पक्ष है ?

स्पष्टीकरण दीजिए ।

(b) If the utility possibility frontier is linear viz.

$$U_A + 2U_B = 400$$

and social welfare is maximized at a corner point, namely at $U_B = 200$, which of these cannot be the social welfare function ? Draw a diagram to explain your answer.

(i) $W = U_B + 2U_A$

(ii) $W = U_A + 2U_B$

(iii) $W = U_A U_B$

(iv) $W = U_A + U_B$

8.5+10

यदि उपयोगिता संभावना वक्र रैखिक अर्थात्

$$U_A + 2U_B = 400$$

हो एवं सामाजिक कल्याण कोने के बिन्दु पर अधिकतम होता है, अर्थात् $U_B = 200$ पर, ऐसे में इनमें से कौनसा समाज कल्याणकारी फलन नहीं हो सकता ? अपना उत्तर स्पष्ट करने के लिए एक आरेख

बनाइए ।

$$(i) \quad W = U_B + 2U_A$$

$$(ii) \quad W = U_A + 2U_B$$

$$(iii) \quad W = U_A U_B$$

$$(iv) \quad W = U_A + U_B$$

3. (a) The demand for energy efficient appliances is given as :

$$P = \frac{100}{Q}$$

The market for energy efficient appliances is perfectly competitive. The marginal (private) cost of production of energy efficient appliances is given as $MC = Q$. By reducing demand on the electricity network, energy efficient appliances generate an external marginal benefit according to $MEB = EQ$, where E is some constant.

- (i) What is the equilibrium amount of energy-efficient appliances traded in the private market ?

- (ii) If the socially optimum quantity of energy efficient appliances is 20, find the value of 'E'.
- (iii) If the government subsidized production of energy efficient appliances by Rs. S per unit, what level of the subsidy would induce the socially efficient level of production ?

ऊर्जा कुशल उपकरणों की माँग

$$P = \frac{100}{Q}$$

के रूप में दी गई है । ऊर्जा कुशल उपकरणों के लिए बाजार पूर्ण प्रतिस्पर्धी है । ऊर्जा कुशल उपकरणों के उत्पादन की सीमांत (निजी) लागत $MC = Q$ है । बिजली नेटवर्क पर माँग को कम करने से, ऊर्जा कुशल उपकरण $MEB = EQ$ के अनुसार एक बाह्य सीमांत लाभ उत्पन्न करते हैं, जहाँ E एक स्थिरांक है ।

- (i) निजी बाजार में व्यापार किए जाने वाले ऊर्जा-कुशल उपकरणों की संतुलन राशि क्या है ?
- (ii) यदि ऊर्जा कुशल उपकरणों की सामाजिक इष्टतम मात्रा 20 है, तो 'E' का मूल्य ज्ञात कीजिए ।
- (iii) यदि सरकार ऊर्जा कुशल उपकरणों के उत्पादन पर Rs. S प्रति यूनिट आर्थिक सहायता (सब्सिडी) देती है, तो आर्थिक सहायता (सब्सिडी) का कितना स्तर उत्पादन के सामाजिक कुशल स्तर को प्रेरित करेगा ?

(b) There are two types of cars in the used car market, "Plums" i.e. good cars and "lemons" i.e. bad cars with hidden defects. Potential buyers are willing to pay a price of P_1 for "Plums" and P_2 for "lemons". There are potential sellers who are willing to sell Plums at $V_1 \leq P_1$ and lemons at $V_2 \leq P_2$. Potential sellers know about the quality of car but the prospective buyers

can't observe the quality of the cars but they know that the proportion of lemons in the market is β .

- (i) What is the expression for the expected value (P^*) of the car to the typical buyer ?
- (ii) Find the conditions under which only lemons will be sold ?
- (iii) Write the conditions under which all cars will be sold ?
- (iv) What should be the minimum value of β in terms of V_1, V_2, P_1, P_2 for all potential sellers to sell their cars ?
- (v) Write the condition under which no car would be sold ?

9+9.5

प्रयोग की गई कारों के बाजार में दो प्रकार की कारें हैं, "प्लम्स" अर्थात् अच्छी कारें और "लेमन्स" अर्थात्

P.T.O.

बुरी कारें । संभावित खरीदार "प्लम्स" के लिए P_1 की कीमत और "लेमन्स" के लिए P_2 भुगतान करने को तैयार हैं । संभावित विक्रेता $V_1 \leq P_1$ पर प्लम्स को तथा $V_2 \leq P_2$ पर लेमन्स बेचने को तैयार हैं । संभावित विक्रेता कार की गुणवत्ता के बारे में जानते हैं परन्तु संभावित क्रेता कारों की गुणवत्ता का अवलोकन नहीं कर सकते लेकिन वे जानते हैं कि बाजार में लेमन्स का अनुपात β है :

- (i) किसी विशेष क्रेता के लिए कार के संभावित मूल्य (P^*) के लिए अभिव्यक्ति क्या है ?
- (ii) किन शर्तों के अंतर्गत केवल लेमन्स बेची जाएँगी ।
- (iii) उन शर्तों को लिखिए जिनके अंतर्गत सभी कारें बेची जाएँगी ?

- (iv) सभी संभावित विक्रेताओं को अपनी कारों को बेचने के लिए V_1, V_2, P_1, P_2 के संदर्भ में β का न्यूनतम मूल्य क्या होना चाहिए ?
- (v) वह शर्त लिखिए जिसके अंतर्गत कोई भी कार नहीं बेची जाएगी ?

4. (a) There are two agents and each agent has utility $U_i(G, X_i)$ where X_i is private consumption and G is the size of public good.

$$G = g_1 + g_2$$

where g_i is agent i 's contribution on the public good.

The price of private consumption is P_X and the price of the public good is P_G . Each agent has an income M_i and thus has an individual budget constraint

$$P_X X_i + P_G g_i = M_i$$

Let the utility functions of two agents be,

$$U_1 = 300 \ln G + X_1 \text{ and}$$

$$U_2 = 200 \ln G + X_2.$$

The incomes of the two agents M_1 and M_2 is given as 1000 each. P_G is given as 1 :

- (i) Write an equation that expresses the condition for the provision of the Pareto efficient level of the public good and find the value of G .
- (ii) Find the amount each person spends on private good, if each person shares the cost of the public good equally ?
- (iii) Do you think as increase in income of both persons will increase the amount of public good provided ? Give reason for your answer.

दो एजेंट हैं तथा प्रत्येक एजेंट की उपयोगिता $U_i(G, X_i)$ है जहाँ X_i निजी उपभोग है तथा G सार्वजनिक वस्तु का आकार है और

$$G = g_1 + g_2$$

हैं, जहाँ g_i कर्मचारी i का सार्वजनिक वस्तु पर योगदान है। निजी उपभोग की कीमत P_X है तथा सार्वजनिक वस्तु की कीमत P_G है। प्रत्येक एजेंट की आय M_i है तथा व्यक्तिगत बजट प्रतिबंध

$$P_X X_i + P_G g_i = M_i$$

है। दो एजेंटों का उपयोगिता फलन

$$U_1 = 300 \ln G + X_1 \text{ तथा}$$

$$U_2 = 200 \ln G + X_2$$

दोनों एजेंटों की आय M_1 तथा M_2 है जो 1000 के बराबर है। P_G का मान 1 है।

(i) एक समीकरण लिखिए, जो सार्वजनिक वस्तु के पेरेटो कुशल मात्रा को व्यक्त करता है और G का मूल्य निकालिए ।

(ii) प्रत्येक व्यक्ति द्वारा निजी वस्तु पर व्यय की गई राशि का पता लगाइए, यदि प्रत्येक व्यक्ति सार्वजनिक वस्तु पर समान व्यय करता है ।

(iii) क्या आपको लगता है कि दोनों व्यक्तियों की आय में वृद्धि से सार्वजनिक वस्तु की मात्रा में वृद्धि होगी ? अपने उत्तर के लिए कारण बताइए ।

(b) What kind of adverse selection problems would you expect health insurance companies to face ? 12+6.5

आप किस प्रकार की प्रतिकूल चयन समस्याओं की अपेक्षा करते हैं जिनका स्वास्थ्य बीमा कंपनियों को सामना करना पड़ता है ?

Section B

(खण्ड 'ब')

5. (a) Each of a group of 10 hunters has two options, either to catch a Stag or Hare. If at least 5 or more hunters pursue the Stag, they catch it (assume that there is a single stag). Captured Stag is shared equally by those who catch it. Those who go after Hare get the whole Hare.
- (i) What will be Nash Equilibria of the strategic game if each hunter prefers $1/10$ of the Stag than a Hare ?
- (ii) What will be Nash equilibria if each hunter prefers $1/7$ of the Stag to a Hare, but prefers a Hare to any fraction smaller than $1/7$ of the Stag.

P.T.O.

10 शिकारी के समूह के प्रत्येक शिकारी के पास दो विकल्प हैं, या तो हिरन पकड़े या खरगोश । यदि कम से कम 5 शिकारी या इससे अधिक शिकारी हिरन का पीछा करते हैं, तो वे इसे पकड़ पाते हैं । पकड़ा हुआ हिरन उन लोगों द्वारा समान रूप से साझा किया जाता है जो इसे पकड़ते हैं । जो शिकारी खरगोश के पीछे जाते हैं वे सभी पूरा खरगोश प्राप्त करते हैं ।

(i) इस युद्ध नीति के खेल का नैश संतुलन क्या होगा अगर प्रत्येक शिकारी खरगोश की तुलना में हिरन के $1/10$ भाग को प्राथमिकता देता है ?

(ii) यदि प्रत्येक शिकारी खरगोश की तुलना में हिरन के $1/7$ भाग को प्राथमिकता देता है, परन्तु यदि हिरन के $1/7$ भाग से छोटा अंश हो तो खरगोश को प्राथमिकता देता है । ऐसे में नैश संतुलन क्या होगा ?

✓ (b) Firm A and B can compete on advertising and R&D.

The table below represents the pay-offs measured in profits (Rs. million) in a one-shot simultaneous move game. Firm 'A's profits are shown first :

		Firm B	
		Advertising	R&D
Firm A	Advertising	3, 3	<u>5</u> , <u>4</u>
	R&D	<u>4</u> , <u>5</u>	2, 2

- (i) Find out all Pure strategy Nash equilibrium of the above game matrix.
- (ii) Find the mixed strategy Nash equilibrium, if any.
- (iii) Draw the best response function diagram and identify all Nash equilibria.
- (iv) What is the expected pay-offs for each firm ?

10+9

P.T.O.

फर्म A तथा B विज्ञापन एवं R&D पर प्रतिस्पर्धा करते हैं। नीचे दी गई तालिका एक-शॉट एक साथ खेलने वाले खेल में मुनाफे में मापा गया भुगतान (मिलियन रुपए) दर्शाती है। फर्म 'A' के लाभ को पहले दिखाया गया है :

फर्म B

	विज्ञापन	अनुसन्धान एवं विकास
--	----------	------------------------

विज्ञापन	3, 3	5, 4
----------	------	------

फर्म A अनुसन्धान

एवं विकास	4, 5	2, 2
-----------	------	------

- (i) उपर्युक्त खेल मैट्रिक्स के सभी शुद्ध रणनीति नैश संतुलन ज्ञात कीजिए।
- (ii) मिश्रित रणनीति नैश संतुलन, यदि कोई हो, तो ज्ञात कीजिए।

(iii) सर्वोत्तम प्रतिक्रिया फलन को आरेखित कीजिए एवं सभी नैश संतुलनों की पहचान कीजिए ।

(iv) प्रत्येक कंपनी के लिए अपेक्षित पारिश्रमिक क्या है ?

6. (a) A thug wants the contents of a safe and is threatening the owner, the only person who knows the code, to open the safe. "I will kill you if you don't open the safe, and let you live if you do." The table below shows the value that each person places on the various possible outcomes :

		Thug (Player 2)	
		Thug Kills	Thug does not kill
Player 1 (Safe Owner)	Open the safe,	1, 2	3, 4
	Do not Open the safe	2, 1	4, 3

- (i) Draw the game tree for this sequential game with Safe Owner going first.
- (ii) What is the sub-game perfect Nash equilibrium of this sequential game ?
- (iii) Is the thug's threat credible ? Should the information holder believe the threat and open the safe ?

एक ठग एक अलमारी की सामग्री चाहता है तथा केवल मालिक ही अलमारी खोलने का कोड जानता है । ठग मालिक को धमकी दे रहा है कि "यदि आप अलमारी नहीं खोलते हैं, तो मैं आपको मार डालूँगा तथा यदि आप खोलते हैं तो मैं आपको जीवित जाने दूँगा ।" प्रत्येक व्यक्ति के विभिन्न संभावित परिणाम नीचे दी गई तालिका में हैं :

खिलाड़ी 2 (ठग)

		ठग मारता है	ठग नहीं मारता है
खिलाड़ी 1	अलमारी खोलता है	1, 2	3, 4
(अलमारी का मालिक)	अलमारी नहीं खोलता है	2, 1	4, 3

- (i) इस अनुक्रमिक खेल के लिए खेल वृक्ष को आरेखित कीजिए यदि अलमारी का मालिक पहला खिलाड़ी है ।
- (ii) इस अनुक्रमिक खेल के लिए उप-खेल परिपूर्ण नैश संतुलन क्या है ?
- (iii) क्या ठग की धमकी विश्वसनीय है ? क्या सूचना धारक को धमकी पर विश्वास करके अलमारी को खोल देना चाहिए ?

✓ (b) Consider the game matrix below :

		Player B	
		L	R
Player A	U	140, 140	20, 160
	D	$90 + X, 90 - X$	50, 50

(i) For what values of X do both players have a dominant strategy ?

(ii) What strategy is/are the Nash equilibria in this case ?

(iii) For what values of X do none of the player has a dominant strategy ? 10+9

निम्नलिखित खेल मैट्रिक्स पर विचार कीजिए :

		खिलाड़ी B	
		L	R
खिलाड़ी A	U	140, 140	20, 160
	D	$90 + X, 90 - X$	50, 50

- (i) X के किन मूल्यों के लिए दोनों खिलाड़ियों की एक प्रमुख रणनीति है ?
- (ii) इस मामले में कौनसी रणनीति नैश संतुलन है/हैं ?
- (iii) X के किन मूल्यों के लिए किसी भी खिलाड़ी की कोई एक प्रमुख रणनीति नहीं है ?

7. (a) Consider the following duopoly game of differentiated products for two firms 1 and 2. Firms have no production costs. The demand curves of duopolists are given as :

$$Q_1 = 1 - P_1 + P_2/4 \text{ and}$$

$$Q_2 = 1 - P_2 + P_1/4$$

where Q_1 and Q_2 are the quantities produced by the duopolist 1 and 2 respectively, and P_1 and P_2 are the prices charged by the two duopolists.

- (i) Solve for the Sub-game perfect Nash equilibrium (SPNE) of the sequential price choice game if player 1 is the first mover. Compute the firm's output and profits.
- (ii) Represent the equilibrium on a best response function diagram.
- (iii) If undercutting is possible, which firm will gain ?

दो फर्मों 1 तथा 2 के विभेदित उत्पादों के निम्नलिखित द्वाधिकारी खेल पर विचार कीजिए । फर्मों की कोई उत्पादन लागत नहीं है । द्वाधिकारियों का माँग वक्र इस प्रकार है :

$$Q_1 = 1 - P_1 + P_2/4 \text{ तथा}$$

$$Q_2 = 1 - P_2 + P_1/4$$

जहाँ Q_1 तथा Q_2 क्रमशः द्वाधिकारियों 1 तथा 2 द्वारा उत्पादित मात्रा हैं, तथा P_1 तथा P_2 दो द्वाधिकारियों द्वारा लगाया जाने वाला मूल्य है :

- (i) यदि खिलाड़ी 1 पहले आरम्भ करता है तो अनुक्रमिक मूल्य चयन खेल के लिए उप-खेल परिपूर्ण नैश संतुलन (SPNE) हल कीजिए । कंपनियों के उत्पादन तथा लाभ की गणना कीजिए ।
- (ii) सर्वोत्तम प्रतिक्रिया फलन आरेख पर संतुलन को प्रस्तुत कीजिए ।
- (iii) यदि कीमत कम करना संभव है, तो किस फर्म को लाभ होगा ?

(b) What is the top-dog strategy in the sequential games ?

15+4

अनुक्रमिक खेलों में टॉप-डॉग रणनीति क्या है ?

P.T.O.

8. A monopolist faces two different demand curves from two kinds of consumers. The demand curves are given by :

$$P_1 = 40 - Q_1 \text{ (for market 1)}$$

$$P_2 = 20 - Q_2/2 \text{ (for market 2)}$$

P_1 and P_2 are the prices charged by the monopolist from the two kinds of consumers. The monopolist has constant average and marginal cost :

$$AC = MC = 10.$$

- (i) What is the optimum linear two part tariff ?
- (ii) What is the linear two part tariff if the monopolist could charge a different entry fee from each kind of consumer ?
- (iii) Suppose now that the monopolist can charge different prices from these two types of consumers and follows a policy of third degree price discrimination, what would be the price charged in each market. Calculate quantity and profits in each market ?

एक एकाधिकारी दो प्रकार के उपभोक्ताओं की दो अलग-अलग माँग का सामना करता है । माँग वक्र इस प्रकार हैं :

$$P_1 = 40 - Q_1 \text{ (बाजार 1 के लिए)}$$

$$P_2 = 20 - Q_2/2 \text{ (बाजार 2 के लिए)}$$

P_1 तथा P_2 दो प्रकार के उपभोक्ताओं से एकाधिकारी द्वारा लगाए गए मूल्य हैं । एकाधिकारी की औसत लागत और सीमांत लागत स्थिर है :

$$AC = MC = 10.$$

- (i) इष्टतम दो भाग रैखिक प्रशुल्क क्या है ?
- (ii) दो भाग रैखिक प्रशुल्क क्या होगा यदि एकाधिकारी प्रत्येक उपभोक्ता से अलग प्रवेश शुल्क ले सकता है ?

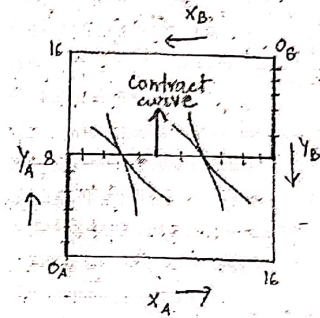
(iii) अब मान लीजिए कि एकाधिकारी इन दो विभिन्न प्रकार के उपभोक्ताओं से अलग-अलग कीमतें वसूल कर सकता है तथा तृतीय श्रेणी कीमत विभेद की नीति का पालन करता है, तो प्रत्येक बाजार में कितनी कीमत वसूली जाएगी ? प्रत्येक बाजार में मात्रा और लाभ की गणना कीजिए ।

B.A (H), Economics, Paper : Intermediate microeconomics-II, 4th Semester, II Year

S. No. of Question Paper: 9190, UPC: 12271401

Date of examination: 09/05/2017

1. a) i) $MRS^A_{XY} = 2\sqrt{Y}$, $MRS^B_{XY} = 2\sqrt{Y}$
 $MRS^A_{XY} = MRS^B_{XY} \rightarrow Y_A = Y_B = 8$



ii) Diagram- Give full marks even if only horizontal contract curve is made.

iii) $P_x/P_y = MRS^A_{XY} = MRS^B_{XY} = 2\sqrt{8}$

$Y_A = Y_B = 8$

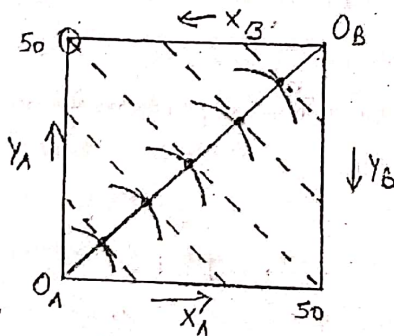
So, $X_A = 12 - 1/\sqrt{2}$, $X_B = 4 + 1/\sqrt{2}$

b) i) First have a voting between p & $m \rightarrow p$ wins,
 then winner of p & m with $n \rightarrow n$ wins.

ii) First have a voting between n & $m \rightarrow m$ wins,
 then winner of n & m with $p \rightarrow p$ wins

iii) yes, as we can see that from the first two parts that how it can be manipulated.

2. a) i) Diagram



ii) $MRS^B_{XY} = Y_B/X_B, MRS^A_{XY} = 1, P_x/P_y = 1, Y_B/X_B = 1$

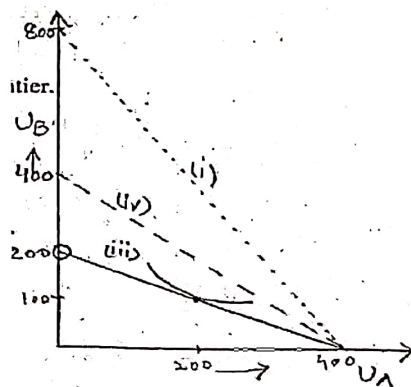
$Y_B = X_B = 25, X_A = Y_A = 25$

- (a) $MRS_{XY}^A = MRS_{XY}^B$, it is Pareto efficient.
 (b) No agent envies the other – therefore equitable.
 © Fair is Pareto efficient and equitable- hence fair

2. b) i) can not be SWF, $U_A = 400$.

ii) can be the SWF as it coincide with utility possibility frontier.

iii) can not be SWF, ($U_B / U_A = 1/2$ at Max).



iv) can not be SWF, (max at $U_A = 400$).

3.a)i) Private optimum occurs where $P = MC$, or $100/Q = Q$. Thus $Q = 10$.

ii) If the socially efficient number of appliances is $Q = 20$, then $P + MEB = MC$ at $Q = 20$, or $100/Q + EQ = Q$. Given $Q = 20$. Solving, we get, $E = 0.75$ or $3/4$.

iii) Level of the subsidy that would achieve social optimum level assuming S as the per unit subsidy will be $100/Q = MC - S$. Since the efficient amount of appliances is $Q = 20$, the proper subsidy would solve $100/20 = 20 - S$ or $S = 15$ per unit.

b) i) $EV = P^* = (1-\beta) P_1 + \beta P_2$ or $P_1 - \beta (P_1 - P_2)$

ii) **Only lemons will be sold** when the expected value or P^* (to the buyer) is less than the value of plums for sellers i.e. V_1 and greater or equal to the value of lemons for buyers. i.e. $V_1 > P^* \geq P_2 \geq V_2$ (condition when only lemons will be sold).

iii) **All cars will be sold** when the P^* is equal or greater than the value of plums to sellers i.e. V_1 . So when $P^* \geq V_1$ and V_2 (condition when all cars will be sold)

iv) Value of β , When $P^* = V_1$

$$(1 - \beta) P_1 + \beta P_2 = V_1$$

$$P_1 - \beta (P_1 - P_2) = V_1$$

so min value of β should be $\beta = \frac{V_1 - P_1}{P_2 - P_1}$ or give 1 mark for any other answer.

v) **No cars will be sold** when the P^* is less than the value of lemons to sellers i.e. V_2 . So when $P^* < V_2$ or give 1 mark for any other answer.

Q. 4. Part (a) (i) First order condition $\rightarrow \sum MRS_{GX}^i = P_G/P_X$

$$300/G + 200/G = 1 \quad \text{Or } G = 300 + 200 = 500$$

(ii) Total cost of Public good is P_g (500)

Contribution of each person would be $500/2 = 250$

Amount left for private good would be $1000 - P_g(250) = 750$

Also Accept if done like this $\rightarrow 300/G + 200/G = 1/P_X$

$$500/G = 1/P_X \rightarrow G = 500P_X$$

Contribution of each person would be $500P_X/2$

Amount left for private good would be $1000 - (250)P_X$

(iii) No as preferences are quasi-linear a unique level of public good is there.

b) "A similar problem arises with health insurance—insurance companies can't base their rates on the *average* incidence of health problems in the population. They can only base their rates on the average incidence of health problems in the group of potential purchasers. But the people who want to purchase health insurance the most are the ones who are likely to need it the most and thus the rates must reflect this disparity. In such a situation it is possible that everyone can be made better off by *requiring* the purchase of insurance that reflects the average risk in the population. The high-risk people are better off because they can purchase insurance at rates that are lower than the actual risk they face and the low-risk people can purchase insurance that is more favorable to them than the insurance offered if *only* high-risk people purchased it. A situation like this, where the market equilibrium is dominated by a compulsory purchase plan, is quite surprising to most economists. We usually think that "more choice is better," so it is peculiar that restricting choice can result in a Pareto improvement. But it should be emphasized that this paradoxical result is due to the externality between the low-risk and high-risk people. In fact there are social institutions that help to solve this market inefficiency. It is commonly the case that employers offer health plans to their employees as part of the package of fringe benefits. The insurance company can base its rates on the averages over the set of employees and is assured that *all* employees must participate in the program, thus eliminating the adverse selection. (Varian, 723-724, 8th ed.)

5. a) i) There are two Nash equilibria of the game are: $(Stag, \dots, Stag)$ and $(Hare, \dots, Hare)$. Any player that deviates from the first profile obtains a hare rather than the fraction $1/10$ of the stag. Any player that deviates from the second profile obtains nothing, rather than a hare.

An action profile in which at least 1 and at most $(5-1)$ i.e. 4 hunters pursue the stag is not a Nash equilibrium, since any one of them is better off catching a hare. An action profile in which at least 5 and at most $(10-1)$ i.e. 9 hunters pursue the stag is not a Nash equilibrium, since any one of the remaining hunters is better off joining the pursuit of the stag (thereby earning herself the right to a share of the stag).

ii) The set of Nash equilibria consists of the action profile $(Hare, \dots, Hare)$ in which all hunters catch hares, and any action profile in which exactly 7 hunters pursue the stag and the remaining 3 hunters catch hares.

Any player that deviates from the first profile obtains nothing, rather than a hare. A player who switches from the pursuit of the stag to catching a hare in the second type of profile is worse off, since she obtains a hare rather than the fraction $1/7$ of the stag; a player who switches from catching a hare to pursuing the stag is also worse off since she obtains the fraction $1/8$ of the stag rather than a hare which is less than $1/7$. No other action profile is a Nash equilibrium, by the following argument.

- If some hunters, but fewer than 5, pursue the stag then each of them obtains nothing, and is better off catching a hare.
- If at least 5 and fewer than 7 hunters pursue the stag then each one that pursues a hare is better off switching to the pursuit of the stag.
- If more than 7 hunters pursue the stag then the fraction of the stag that each of them obtains is less than $1/7$, so each of them is better off catching a hare.

5. b) i) There are two **Pure strategy equi.** (Advertising, R&D) (R&D, Advertising)

ii) **Mixed Strategy equi.** → Let p be the probability that Firm A chooses Advertising, so $1-p$ is the probability that Firm A chooses R&D.

• Let q be the probability that Firm B chooses advertising, so $1-q$ is the probability that Firm B chooses R&D.

• To find mixed strategies, we compute the Expected payoffs of firm A and Firm B (EP_A) and (EP_B) with probabilities $(p, 1-p)$ and $(q, 1-q)$.

- Firm A : $EP_A [(p, 1-p), (q, 1-q)] = 3pq + 5p(1-q) + 4(1-p)q + 2(1-p)(1-q)$

$$= 3pq + 5p - 5pq + 4q - 4pq + 2 - 2p - 2q + 2pq = -4pq + 3p + 2q + 2$$

Equate EP_A at $p = 0$ and EP_A at $p = 1$

$$2q + 2 = -2q + 5, \quad \mathbf{q = 3/4}$$

• Firm B: $EP_B [(q, 1-q), (p, 1-p)] = 3qp + 5q(1-p) + 4(1-q)p + 2(1-q)(1-p)$

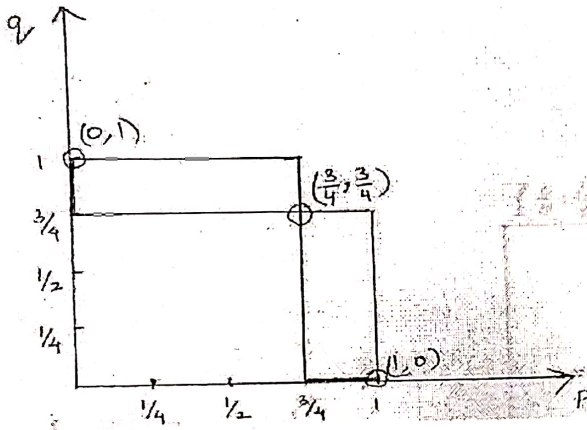
$$= 3qp + 5q - 5qp + 4p - 4qp + 2 - 2p - 2q + 2qp = -4pq + 2p + 3q + 2$$

Equate EP_B at $q = 0$ and EP_B at $q = 1$

$$2p + 2 = -2p + 5, \quad \mathbf{p = 3/4}$$

So the mixed strategy equilibrium is $\mathbf{p = 3/4}$ and $\mathbf{q = 3/4}$.

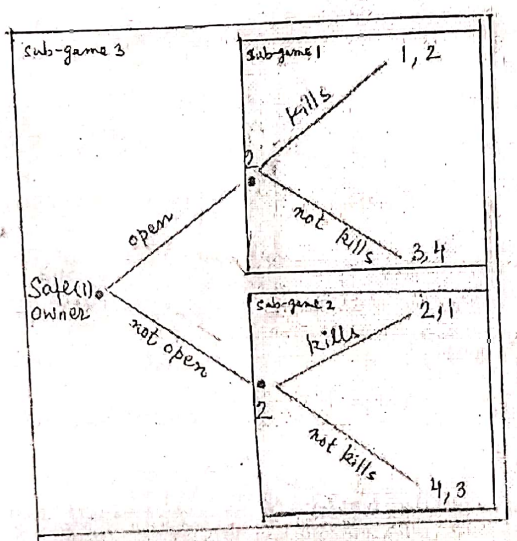
iii)



iv) Putting values of $p = 3/4$ and $q = 3/4$ in the Expected payoff function to get:

• $EP_A = -4pq + 3p + 2q + 2 = \underline{7/2 = 3.5}$. $EP_B = -4pq + 2p + 3q + 2 = \underline{7/2 = 3.5}$

6. a) i) and ii)



ii) A sub-game perfect Nash equi. is a strategy profile that is a Nash equi. on every proper sub-game. Identify 3 sub-games and show Nash equi.

SPNE: Safe owner not open; thug not kill/open, not kill/not open with payoff (4,3)

If only Payoffs are written- give only 1 mark.

If only descriptive explanation of SPNE- give only 1 mark.

Or accept any answer if explanation is given showing equi. path.

iii) No, the thug's threat is not credible, because if safe owner chooses not to open the safe even then SPNE strategy of thug is to **not kill**, so it's an empty threat.

$$6. b) i) B \rightarrow 50 > (90 - X) \rightarrow X > 40 \quad (1)$$

$$A \rightarrow (90 + X) > 140 \rightarrow X > 50 \quad (2)$$

$$\text{So, } X > 50$$

ii) Down, Right with payoffs (50, 50)

$$iii) 140 > (90 + X) \rightarrow 50 > X \quad (1)$$

$$(90 - X) > 50 \rightarrow X \leq 40 \quad (2)$$

$$\text{So, } X \leq 40.$$

Note: If only $X > 50$ in first part and $X < 40$ in third part – deduct 1 mark.

If only $X \geq 50$ in first part and $X < 40$ in third part – give full marks.

$$Q. 7. a) i) \text{ Let } Q_1 = 1 - P_1 + P_2/4$$

$$Q_2 = 1 - P_2 + P_1/4$$

$$P_1 Q_1 = \Pi_1 = P_1 - P_1^2 + P_1 P_2/4$$

$$P_2 Q_2 = \Pi_2 = P_2 - P_2^2 + P_1 P_2/4$$

$$\delta \Pi_2 / \delta P_2 =$$

$$1 - 2P_2 + P_1/4 = 0$$

$$BR_2(P_1) \rightarrow P_2 = P_1/8 + 1/2$$

Put this in profit function of firm 1.

$$\Pi_1 = P_1 - P_1^2 + P_1/4 (1/2 + P_1/8)$$

$$\delta \Pi_1 / \delta P_1 = 9/8 - 2P_1 + 1/16 P_1 = 0$$

$$P_1 = 18/31 P_2 = 71/124$$

$$P_1 = 0.5806 \quad P_2 = 0.5725$$

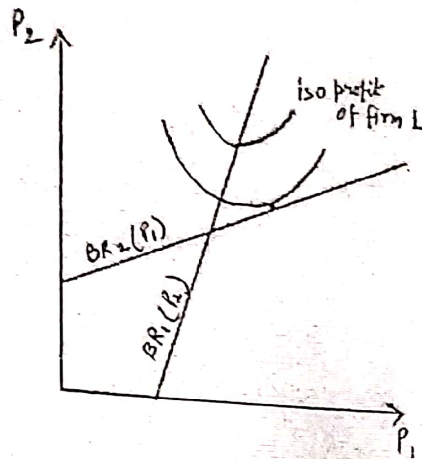
$$Q_1 = 0.563$$

$$Q_2 = 0.575$$

$$\Pi_1 = 0.326 \quad \Pi_2 = 0.327$$

$$(ii) BR_2(P_1) \rightarrow P_2 = P_1/8 + 1/2$$

$$BR_1(P_2) \rightarrow P_1 = P_2/8 + 1/2$$



Best Response curves

(iii) Firm 1 will gain by lowering its price or give 2 marks for any other answer.

7. b) In the Stackelberg game, the leader uses what has been called a "top dog" strategy, aggressively overproducing to force the follower to scale back its production. The leader earns more than in the associated simultaneous game (Cournot), while the follower earns less. While it is generally true that the leader prefers the sequential game to the simultaneous game (the leader can do at least as well, and generally better, by playing its Nash equilibrium strategy from the simultaneous game), it is not generally true that the leader harms the follower by behaving as a "top dog." Sometimes the leader benefits by behaving as a "puppy dog," as illustrated in Example 15.9. (Top dog strategy – page 501, N&S.)

Q. 8. (i) Optimal Tariff $\rightarrow \Pi = 2a + (p - MC)(q_1 + q_2)$

If only formula of optimal tariff- give only 1 mark.

$$\begin{aligned}\Pi &= (0.5)(2)(40-2P)(20-P) + (P-10)(80-3P) \\ &= (40-2P)(20-P) + (P-10)(80-3P) \\ &= 800-40P-40P+2P^2 + 80P - 3P^2 - 800+30P \\ &= -P^2 + 30P = 0\end{aligned}$$

$$d\Pi/dp = -2P+30 = 0 \rightarrow \underline{P = 15}$$

$$\text{entry fee} \rightarrow a = (0.5)(40-2P)(20-P) = \underline{25}$$

$$\text{Optimal Tariff} = 25 + 15Q$$

(ii) He would charge an entry = amount of consumer surplus in each market following the Oipricing schedule $P_1 = P_2 = MC = 10$

Consumer surplus in market 1

$$(.5)(40-10)(30) = 450$$

$$T(Q_1) = 450 + 10Q_1$$

(iii) Third 3rd Degree P.D

Consumer surplus Mkt.2

$$(.5)(20-10)(20) = 100$$

$$T(Q_2) = 100 + 10Q_2$$

$MR_1 = 40 - 2Q_1 = 10$

$MR_2 = 20 - Q_2 = 10$

$Q_1 = 15$

$Q_2 = 10$

$P_1 = 25$

$P_2 = 15$

Profits = 225

Profits = 50

Marking Scheme

Q. 1 a) i	3	Q 1 b) i	3
ii	3	ii	3
iii	3.5	iii	3
Q 2 a) i	2.5	Q 2 b) i	2.5
ii	2+2+2→if there is no explanation- give no marks.	ii	2.5
		iii	2.5
		iv	2.5
Q 3 a) i	3	Q 3 b) i	2.5
li	3	li	2.5
lii	3	lii	2.5
		lv	1→ for any answer
		v	1→ for any answer
Q 4 a) i	6	Q 4 b)	6.5
li	2		
iii	4		
Q 5 a) i	5	Q 5 b) i	1
li	5	li	2
		lii	3
		lv	3
Q 6 a) i	3	Q 6 b) i	3
li	4	li	3
lii	3	lii	3
Q 7 a) i	8 → 4 for SPNE, 2 for profits & 2 for output	Q 7 b)	4
li	5→ 1 for BR, 3 for isoprofit& showing equi.		
lii	2 → for any answer.		
Q 8 i	6		
li	6		
iii	7, 3+2+2		
