2025

ECONOMICS — HONOURS

Paper : DSCC-9

(Microeconomics - III)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) Define monopsony.

(b) What do you mean by moral hazard?

(c) Explain the concept of conjectural variation.

(d) Define perfect price discrimination.

(e) Calculate the Lerner index if price (P) = ₹ 20 and marginal revenue (MR) = ₹ 10.

(f) Mention two features of a monopolistic competitive market.

(g) What is a contract curve?

(h) Define natural monopoly.

(i) What is meant by the Tragedy of the Commons?

(j) What do you mean by negative externality?

(k) Between an oligopolist and a monopolist, who will be more interested to advertise? Give reason.

(l) Define an isoprofit curve.

(m) Mention two reasons for the emergence of monopoly.

(n) What is a multiplant monopolist?

(o) Define marginal revenue product of labour.

Group - B

2. Answer ***any five*** questions :

(a) "There is a practice of charging higher prices during peak periods when capacity constraints lead to high marginal costs." — Justify the statement. 5

(b) How can you measure the deadweight loss due to the inefficiency of monopoly? 5

(c) What do you mean by price leadership? Explain the concept of barometric price leadership in this context. 2+3

(d) Distinguish between perceived and proportional demand curve. 5

(e) Let the demand function be given by $P = a - bQ$ and the cost function be given by $C = eQ^2 + fQ$. Determine the revenue maximizing and profit maximizing output, when a, b, e, $f > 0$. 2+3

(f) What is a Nash Equilibrium? Determine the Nash Equilibrium from the following table where A and B are the players : 5

Strategies of Player A	Strategies of Player B	
	1	2
1	(2,1)	(0,0)
2	(0,0)	(1,2)

(g) Explain the difference between adverse selection and moral hazard with an example. 5

(h) "The long run equilibrium under monopolistic competition is characterized by excess capacity." —Justify the statement. 5

Group - C

Answer ***any three*** questions.

3. (a) How wages can be determined in an imperfectly competitive labour market? Explain the concept of monopsonistic exploitation in this context.

(b) Is it possible for the trade unions to eliminate the exploitation and raise the wage rate? (4+1)+5

4. (a) Why does a monopolist operate at the elastic portion of the demand curve?

(b) Is it possible for the monopoly equilibrium to occur at the falling portion of the marginal cost curve?

(c) A monopolist operates in two markets and faces the following demand functions in market-I and market-II respectively.

$P_1 = 80 - 5Q_1$

$P_2 = 180 - 20Q_2$

The cost function is given by $C = 50 + 20\ (Q_1 + Q_2)$.

Determine the price and output in each of these markets. Prove that higher price is charged in the market with lower price elasticity of demand. 2+2+(1+1+1+1+2)

5. (a) Why is the MR curve in Sweezy Model discontinuous? In this context show that the oligopolistic prices are rigid in Sweezy's model.

(b) Show that the Nash Equilibrium does not necessarily lead to efficient outcomes with the game of Prisoner's Dilemma. 6+4

6. (a) Discuss the Pareto optimality condition of efficiency in consumption or exchange.

   (b) Show that Pareto optimality conditions are satisfied under perfect competition. 5+5

7. (a) Show that for a linear demand curve of a monopolist, the marginal revenue curve bisects the horizontal intercept made by the demand curve.

   (b) Consider a duopolistic market for an identical product with the following market demand function and the cost functions of the firms 1 and 2.

   $P = 100 - 0.5\,(Q_1 + Q_2)$; $C_1 = 5Q_1$, $C_2 = 0.5Q_2^2$

   Determine the output in each market, total output and price with the assumption that each firm maximizes its profit with respect to its own price. 4+6

2025

ECONOMICS — HONOURS

Paper : DSCC-10

(Macroeconomics - III)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) Distinguish between forward-looking expectation of Rational Expectations model and backward-looking expectation of Keynesian model.

(b) Explain intertemporal substitution of labour in RBC theory.

(c) Define Solow residual.

(d) What are the Keynes' Conjectures?

(e) Define critical level of interest rate.

(f) What is consumption smoothing?

(g) What is absolute β convergence?

(h) How does 'Efficiency Wage' relate to the concept of Real Wage Rigidity of New Keynesian Theory?

(i) What is the common measure of technology shock in Real Business Cycle?

(j) Define Borrowing Constraint.

(k) Explain the role of wealth on consumption in Life Cycle Consumption Hypothesis.

(l) Define 'natural rate of growth' in Harrod-Domar Growth model.

(m) Define 'Permanent Income' as proposed by Friedman.

(n) How do 'Plungers' behave while making Portfolio Decisions?

(o) What are the basic features of AK Model of endogenous growth?

(p) What is total cost of holding money in Baumol-Tobin model?

Group - B

2. Answer ***any five*** questions :

   (a) Explain the basic concept of Life Cycle Hypothesis by Ando-Modigliani. 5

   (b) Explain what happens when there is a temporary divergence of the actual rate of growth from the warranted rate of growth in Harrod's model. 5

   (c) Write a note on Golden Rule of Capital Accumulation in Solow's growth model. 5

   (d) Derive the aggregate demand for money function with regressive expectations. 5

   (e) Explain when Rational Expectation solution differ from Perfect Foresight. 5

   (f) Explain Friedman's assumption of 'no correlation between transitory and permanent income'. 5

   (g) What is Harrod-Domar condition? Explain the reason of instability of the condition. 2+3

   (h) Explain the concept of interest rate rigidity in New Keynesian Framework. 5

Group - C

Answer ***any three*** questions.

3. Determine the conditions of steady state in Solow Growth Model. What will be the impact of population growth on steady state equilibrium? 7+3

4. Explain how risk consideration is being introduced in the determination of the demand for money in Portfolio Balance Approach. Derive demand for money using the above approach. 2+8

5. Mention two relative income hypotheses proposed by Duesenberry. Explain the consumption theory based on these hypotheses. 4+6

6. Mention the distinctive feature of aggregate supply and labour supply schedule in Rational Expectation Model as compared to Keynesian Model. Explain how neutrality of money holds in Rational Expectation Model with anticipated changes. 4+6

7. Define efficiency wage as proposed by Shapiro and Stiglitz. Explain the role of No-Shirking Condition (NSC) in determining equilibrium efficiency wage. 2+8

2025

ECONOMICS — HONOURS

Paper : DSCC-11

(Mathematical Economics - II)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) What is a zero-sum game? Give one simple example.

(b) What is a mixed strategy? Why do players use it?

(c) Define Nash equilibrium in one sentence.

(d) What is backward induction? Name one game where it is used.

(e) Evaluate : $\int \left(3x^2 + 4\right) dx.$

(f) If $MR(X) = 20 - 2x$, find the total revenue function $TR(x)$.

(g) Solve the first-order difference equation : $X_{t+1} = 0.5\ x_t;\ x_0 = 2.$

(h) What is a fixed point of a dynamic system?

(i) Solve : $\frac{dy}{dx} = 4y$.

(j) Name one macroeconomic model that uses differential equations and write down the equation.

(k) What do you mean by 'dynamics' in economic analysis?

(l) What is the present value of a perpetual cash flow of ₹ 2,460 per year discounted at $r = 8\%$?

(m) State whether the following differential equation is a first-order differential equation :

$$\left(\frac{dy}{dt}\right)^3 + u(t)y = w(t).$$

(n) If the net investment rate $I(t)$ is given by $I(t) = 6t^2 + 4t$, find the increase in capital stock (K) over the period from $t = 0$ to $t = 3$.

(o) Given the general solution $y(t) = A_1 e^{r_1 t} + A_2 e^{r_2 t}$. If $r_1 = 3$ and $r_2 = -3$, will the system return to equilibrium as $t \to \infty$?

Group - B

Answer ***any five*** questions.

2. Find the Nash equilibrium of the Prisoners 'Dilemma Game : 5

		Player 2	
Player 1	Strategy	*NC*	*C*
	NC	(–1, –1)	(–10, 0)
	C	(0, –10)	(–5, –5)

3. Compute the integral using substitution : $\int x\sqrt{x^2+1}\,dx$. 5

4. Draw a qualitative phase diagram of a one-variable system with a stable fixed point. Explain stability in your own words. 5

5. Set the Cobweb model and state the stability condition. Explain the model with the help of a diagram. 5

6. Let the demand and supply functions be :

$$Q_d = \alpha - \beta P - \gamma \frac{dP}{dt}$$

$$Q_s = \delta P \qquad (\alpha, \beta, \gamma, \delta > 0)$$

(a) Assuming that the market is cleared instantly, find the time path of price, $P(t)$.

(b) Does the market have a dynamically stable intertemporal equilibrium? 4+1

7. Consider a linear Phillips relation

$$\omega = \alpha - \beta U,$$

where ω is the rate of growth of money wage and U is the rate of unemployment. The rate of inflation (p) is defined as :

$$p = \omega - T,$$

where T is the rate of growth of labour productivity. Now consider the following expectations-augmented Phillips relation.

$$\omega = f(U) + g\pi \quad (0 < g \leq 1),$$

where π is the expected rate of inflation. Assuming perfect foresight i.e. $\pi = p$.

(a) Derive the differential equation in the variable p.

(b) What change in parameter restriction is necessary to make the differential equation meaningful? 4+1

8. Consider a closed economy with consumption (C) function, investment (I) function and national income (Y) identity are as shown below :

$$C_t = \gamma Y_{t-1} \qquad (0 < \gamma < 1)$$
$$I_t = \alpha(C_t - C_{t-1}) \qquad (\alpha > 0)$$
$$Y_t = C_t + I_t + G_0 \qquad (G_0 > 0)$$

(a) Make a second-order linear difference equation of Y from the above model.

(b) When will you get a convergent time path of Y? 3+2

9. Find the solution of the following difference equation :

$$y_{t+2} + y_{t+1} - 2y_t = 12$$

with $y_0 = 4$ and $y_1 = 5$. 5

Group - C

Answer ***any three*** questions.

10. (a) Explain the concept of iterated elimination of dominated strategies using the given fictional payoff matrix. Show all steps clearly and identify the final outcome.

Strategies ↘		*Player B*				
		B_1	B_2	B_3	B_4	B_5
Player A	A_1	2	4	3	8	5
	A_2	4	5	2	6	7
	A_3	7	6	8	7	6
	A_4	3	1	7	4	2

(b) What is Fair game? Is the following game affair one? 6+4

		Player B	
		B_1	B_2
Player A	A_1	0	2
	A_2	2	5

11. Solve the system : $\frac{dx}{dt} = 2x + y$, $\frac{dy}{dt} = -x + 4y$.

(a) Find eigenvalues and eigenvectors.

(b) Classify the fixed point at the origin.

(c) Provide a qualitative sketch of the phase diagram. 4+3+3

12. Consider the following dynamic price adjustment model in a single market :

$$\frac{dp}{dt} = \alpha\big(D(p) - S(p)\big),$$

where demand and supply functions are given by

$$D(p) = a - bp, \quad S(p) = c + dp,$$

with a, b, c, d, $\alpha > 0$.

(a) Derive the differential equation in $p(t)$.

(b) Solve the equation to find $p(t)$.

(c) Find the equilibrium price p^*.

(d) Using the solution, determine the condition under which the equilibrium is **stable**.

(e) Provide a qualitative phase diagram showing stable or unstable adjustment. 2+2+2+2+2

13. Consider the following IS-LM model :

$C = a + bY - IR$	(consumption demand)
$I = \bar{I}$	(investment demand)
$G = \bar{G}$	(government demand)
$L = kY - hR$	(money demand)
$M = \bar{M}$	(money supply)

Assume money market clears instantly (i.e. money supply is always equal to money demand) but goods market adjusts gradually at speed 'α' in response to the gap between the aggregate demand and aggregate supply.

(a) Derive the differential equation for Y.

(b) Solve for $Y(t)$.

(c) Determine the condition on the parameters that must be satisfied for the equilibrium to be stable. 4+4+2

14. (a) Two firms share the market for a product. Firm 1's output is x; firm 2's output is y. The two reaction function of the firms are

$$x_{t+1} + \beta y_t = b \quad \beta \neq 1$$

$$y_{t+1} + \alpha x_t = b \quad \alpha \neq 1.$$

Derive and solve the second-order difference equation for x implied by the model.

(b) The demand function, supply function and the price adjustment process are shown by the following equations respectively,

$$Q_{dt} = 21 - 2P_t$$

$$Q_{st} = -3 + 6P_t$$

$$P_{t+1} = P_t - 0.3\,(Q_{st} - Q_{dt}).$$

Find the time path P_t and determine whether it is convergent. 5+(3+2)

2025

ECONOMICS — HONOURS

Paper : DSCC-12

(Econometrics - I)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) What is the most salient difference between economic model and econometric model?

(b) State whether the following statements are true or false :

(i) The conditional and unconditional means of a random variable are the same thing.

(ii) Even though the disturbance term in the CLRM is not normally distributed, the OLS estimates are still unbiased.

(iii) The t test requires that the sampling distribution of β_1 and β_2 follow normal distribution.

(iv) If there is no intercept term in the regression model, then the estimated error term will sum to zero,

(c) Consider the following regression results and fill in the blanks :

$(\text{Consumption})_i = 24.4545 + 0.5091\ (\text{Income})i$

SE = (6.4138) (?)

t = (?) (14.2605)

(d) The following ANOVA table is provided :

ANOVA Table

Source of variation	Sum of Squares	Degrees of Freedom
Regression	10,357	8
Residual	23,311	168

Determine the value of F-statistic.

(e) In a two variable PRF,

$E(Y \mid X_i) = \beta_1 + \beta_2 X_i$.

If the slope coefficient is zero, then what does that mean?

(f) In a simple linear regression model if all the observations of the independent variable are increased by a constant k, then how will the slope coefficient be affected?

(g) Consider the following regression equation :

$\hat{Y} = 3.6 + 0.75X$

SE = (2.09) (0.256)

$t =$ 2.930

$n = 10$

Calculate r.

(h) Determine the type of data represented by the following variables :

(i) Population of 26 states of India in the year 2021.

(ii) Consumer Price Index in seven industrial countries for the period 1973-1997.

(i) State the Gauss-Markov theorem.

(j) What do you mean by forecast error?

(k) What is meant by a first order autoregressive model?

(l) In the simple linear regression model $y = \beta_0 + \beta_{1X} + u$, suppose that $E(u) \neq 0$. Letting $\alpha_0 = E(u)$, show that the model can always be rewritten with the same slope, but a new intercept and error, where the new error has a zero expected value.

(m) Distinguish between 'error' and 'residual' in the context of an econometric model.

(n) What is the difference between ex-ante and ex-post forecast?

(o) What is the difference between a deterministic relation and a stochastic relation?

Group - B

Answer ***any five*** questions.

2. The correlation between yield and rainfall is given by $r = 0.6$. However, temperature correlates both with yield ($r = 0.5$) and rainfall ($r = 0.8$). Find the correlation between yield and rainfall eliminating the effect of temperature. 5

3. (a) State one reason behind heteroskedasticity.

(b) What are its consequences?

(c) Mention a test for heteroskedasticity.

(d) Which distribution does this test statistics follow? 1+2+1+1

4. Consider the following regression equation :

$\hat{Y}_t = 29.5192 + 0.7136\ X_t$

SE = (4.1180) (0.0512)

$r^2 = 0.9584$, Durbin Watson statistics $(d) = 0.1229$, $n = 20$.

(Given : Corresponding to 5% level of significance, $n = 20$ and number of regressors = 1, the critical d values are $d_L = 1.201$ and $d_U = 1.411$)

(a) On the basis of the given information comment whether autocorrelation is present, and if so, what is the nature of autocorrelation?

(b) State two drawbacks of Durbin-Watson test. 3+2

5. Consider the following regression equation :

income = $\beta_0 + \beta_1$ hw + β_2 ex,

where hw = number of hours worked; ex = years of experience.

If ex = $\alpha_0 + \alpha_1$hw, then

(a) What problem will you face in estimating the regression equation?

(b) State any one method that solves this problem. 3+2

6. (a) Consider the model $y = e^{\alpha+\beta x+u}$. Is it a linear regression model? Why or why not?

(b) Consider the following estimated regression equation : $Y_i = \hat{\alpha} + 1.5X_i + e_i$, where the estimated standard error of the slope coefficient is 0.5. It has further been given that $r^2 = 0.5$, $\bar{x} = 10$, $\bar{y} = 25$ and $\Sigma y_i^2 = 6895$. Find the sample size (n), Total Sum of Squares (TSS) and estimated error variance. 2+3

7. (a) In a two-variable classical linear regression model, show that Total Sum of Squares (TSS) is equal to the sum of Explained Sum to Squares (ESS) and Residual Sum of Squares (RSS).

(b) In the regression $Y_i = \beta_0 + \beta_1 X_i + u_i$ suppose we multiply each X-value by a constant 2. Will it change the residuals and the fitted values of Y? What will happen if we add a constant 2 to each X-value? 2+3

8. Two variables Y and X are believed to be related by the following stochastic equation :

$$Y_i = \beta_0 + \beta_1 X_i + u_i,$$

where u_i is the usual random disturbance term with zero mean and constant variance σ^2. You are given the following information : $n = 8$, $\Sigma X = 24$, $\Sigma X^2 = 75$, $\Sigma Y = 108$, $\Sigma Y^2 = 1620$ and $\Sigma XY = 343.5$. (i) Find the estimators of β_0 and β_1; (ii) Find the value of coefficient of determination; (iii) Test whether the slope coefficient is significantly different from zero at 1% level of significance (given $t_{0.005,\ 6} = 3.70$). 2+1+2

Please Turn Over

9. Consider the regression model $Y_i = \beta X_i + u_i$ under the Gauss-Markov Assumptions. Derive the OLS estimator of β and show that it is unbiased. 3+2

Group - C

Answer ***any three*** questions.

10. (a) Define coefficient of determination (R^2). What role does it play in econometric analysis?

(b) Consider the following estimated regression equation :

$$\log(G) = -10.477 - 0.387\log(P_G) + 2.472\log(Y)$$
$$SE = \quad (5.67) \quad (1.16) \quad (20.04)$$
$$\bar{R}^2 = 0.969; n = 14$$

where G = per capita consumption of gasoline; P_G = retail gasoline price; Y = per capita disposable income at constant prices.

(i) What does the coefficient of Y stand for? Is it significant at 1% level?

(ii) What is the price elasticity of demand for per capita gasoline consumption? Discuss the sign and magnitude of this coefficient.

(iii) Determine the value of R^2 from the given value of $\bar{R}^2$.

[Given $t_{0.005,\ 11} = 3.106$] (1+2)+(2+3+2)

11. (a) Write a short note on importance of dummy variable in econometric analysis.

(b) Consider the following estimated regression equation :

$$\hat{Y}_i = 22.008 - 0.002W - 2.76D_{2i} + 3.280D_{3i} + 0.415EPA$$
$$SE = \quad (0.001) \quad (0.708) \quad (1.413) \quad (0.097)$$
$$\bar{R}^2 = 0.82; n = 33$$

where Y = miles per gallon

W = weight of the car (pounds)

D_{2i} = 1 for automatic transmission

= 0 otherwise

D_{3i} = 1 for diesel

= 0 otherwise

EPA = mileage rating by EPA (Environmental Protection Agency)

(i) Interpret the regression coefficient of D_2 in the above model. Is it significant at 1% level?

(ii) Interpret the regression coefficient of D_3 in the above model. Is it significant at 1% level?

[Given $t_{0.005,\ 28} = 2.763$] 5+(2½+2½)

12. (a) State the assumptions of classical linear regression model.

(b) Two variables Y and X are belived to be related by the following stochastic equation :

$Y = \alpha + \beta X + U$,

where U is the usual random disturbance term with zero mean and constant variance (σ^2).

To check this relationship one researcher takes a sample of size 8 and estimates β with OLS. Another researcher takes another sample of size 8 and estimates β with OLS. The data they used and the results they obtained are as follows :

Researcher I	
Y	X
4.0	3
4.5	3
4.5	3
3.5	3
4.5	4
4.5	4
5.5	4
5.0	4

$\hat{Y} = 1.857 + 0.75X$

SE = (1.20) (0.339)

$r^2 = 0.45$; $\hat{\sigma} = 0.48$

Researcher II	
Y	X
2.0	1
2.5	1
2.5	1
1.5	1
11.5	10
10.5	10
10.5	10
11.5	10

$\hat{Y} = 1.5 + 0.97X$

SE = (0.27) (0.038)

$r^2 = 0.99$; $\hat{\sigma} = 0.48$

(i) Can you explain why the SE of β for the first researcher is larger than the SE of $\hat{\beta}$ of the second researcher?

(ii) Which estimated model according to you is better and why? 5+(3+2)

13. (a) Explain mathematically and intuitively what would happen if you tried to fit a regression equation when all the values of the explanatory variables in the sample are the same.

(b) Consider the following regression result : $\hat{Y}_i = 2.20 + 0.104X_{1i} + 3.48X_{2i}$.

p-value 0.000 0.001 0.044

ESS = 112.5, RSS = 19.5, $n = 10$

(i) Which of the estimated slope coefficients are statistically significant at 1% level of significance?

(ii) Calculate the value of R^2 and adjusted-R^2.

(iii) Calculate the F-statistic and interpret it. [Given $F_{0.01,\,2,\,7} = 9.55$; $F_{0.01,\,7,\,2} = 99.36$] 5+5

14. (a) A regression of average daily earnings (E) measured in rupees on age (A) measured in years using a random sample of workers yields

$$\hat{E} = 696.7 + 9.6\,A\ ;\ R^2 = 0.023,\ RSS = 1542.2$$

(i) What are the units of RSS and R^2?

(ii) What is the predicted earning of a 30 years old worker?

(iii) What is the average increase in earning for one year increase in age?

Please Turn Over

(b) Consider the following model :

$$\hat{Y}_i = -0.2610 - 2.3606\ D_i + 0.8028\ X_i \quad (D_i = 1 \text{ if female, 0 otherwise})$$

$$\text{SE} = (1.1073)\ (0.4302)\ (0.08101) \qquad R^2 = 0.2032;\ n = 528$$

Here Y = hourly wage and X = year of schooling.

(i) Interpret the meaning of the coefficients in the above model.

(ii) Test in the context of the above model whether there is any difference in hourly wage between males and females.

(iii) Test in the context of the above model whether hourly wage is significantly related to years of schooling. [Given : $t_{0.01,\ 525} = 2.576$]. (1+1+1)+(3+2+2)