UNIVERSITY OF NORTH BENGAL

B.A. Honours Part-II Examination, 2022

ECONOMICS

PAPER-IV

Time Allotted: 4 Hours   Full Marks: 100

The figures in the margin indicate full marks.
All symbols are of usual significance.

GROUP-A
MATHEMATICAL ECONOMICS

SECTION-I
[Objective type questions (Compulsory)]

1.   Answer the following questions: 2×5 = 10

(a) The time path of income is given as $y_t = 2^t + 2$. Evaluate the stability of the equilibrium.

(b) Write the equilibrium conditions mathematically of discriminating monopoly.

(c) Define saddle point and determine it from the following pay-off matrix:

$$\begin{bmatrix} -1 & 0 & 2 \\ 3 & 1 & 1 \\ 0 & 1 & 2 \end{bmatrix}$$

(d) How much increase in investment is required to raise income by Rs. 5000 crores, if MPC is 0.75?

(e) Find the Harrodian growth path of income if the warranted rate of growth is s/v.

SECTION-II
[Short essay-type questions]

Answer any *two* questions   10×2 = 20

2. (a) What do you mean by a basic feasible solution in a linear programming problem?   5+5 = 10

(b) Pay-off matrix of player A in a two-person zero-sum game is given below:

Player - B

$$\text{Player - A} \begin{bmatrix} 3 & 1 & 1 \\ 1 & 1 & 5 \\ 1 & 4 & 1 \end{bmatrix}$$

Construct a linear programming problem with respect to player B.

3.   Outline Domar's Model of growth.   10

4.   A monopolist has the following types of total cost and demand functions: 5+5 = 10

$$C = aQ^2 + bQ + c$$
$$P = \beta - \alpha Q$$

What is the profit maximizing output level, when the firm is assumed to fix the output? Verify that this is the same result as when the monopolist fixes the price.

5.   Find the limits as $t \to \alpha$ of the ratio of national debt (D) to national income (Y)   10
in the following model:

$$\frac{dD}{dt} = 0.2y(t) + 10$$

$$\frac{dy}{dt} = 0.5y(t)$$

and $Y(0) = 100,\; D(0) = 0$

SECTION-III

[Essay-type questions]

Answer any *one* question   20

6. (a) If the profit functions of two duopolists in an industry are given as   10+10=20

$$\pi_1 = 12Q_1 - 2Q_1^2 - Q_2$$
$$\pi_2 = 6Q_2 - Q_2^2 - Q_1$$

then find Q_1, Q_2, π_1 and π_2

Under
(i) Cournot Solution
(ii) Joint maximization

(b) Consider the following pay-off matrix:

Player B

$$\text{Player A} \quad \begin{array}{c} A_1 \\ A_2 \end{array} \begin{pmatrix} 1 & 4 \\ 5 & 3 \end{pmatrix}$$

with columns $B_1\; B_2$

Find the mixed strategies of the two players and also the value of the game.

7. (a) Outline the Cobweb model.   10+10=20

   (b) Given the Cobweb model below as

$$Q_t^d = 18 - 3P_t$$

$$Q_t^s = -3 + 4P_{t-1}$$

$$Q_t^d = Q_t^s$$

Determine the inter-temporal equilibrium price and the different stability condition for the time path.

GROUP-B

STATISTICS

SECTION-I

[Objective type questions (Compulsory)]

8.   Answer the following questions: 2×5 = 10

   (a) Define type-I and type-II errors.

   (b) What is the basic differences between correlation and regression?

   (c) Explain the concept of probability density function.

   (d) Distinguish between parameter and statistic.

   (e) Define standard normal variable.

SECTION-II

[Short essay-type questions]

Answer any *two* questions   10×2 = 20

9.   If a random variable follows binomial distribution, find its mean, variance and S.D.   10

10.   Prove that Poisson distribution is a limiting case of Binomial distribution.   10

11.   What are the coefficient of regression? Derive their expressions in a bivariable regression model. Also show that   2+6+2=10

$$\gamma^2 = b_{xy} \cdot b_{yx}$$

12.   Fit a straight line trend to the following data on production of sugar and obtain the trend value for 2009:

Year	1994	1995	1996	1997	1998	1999	2000	2001
Production (in '000 tons)	77	88	94	85	91	98	97	100

SECTION-III

[Essay-type questions]

Answer any *one* of the following 20

13.(a) Define conditional probability. State and prove one theorem of compound 10+10 = 20 probability.

(b) Find the mean and the standard deviation of binomial distribution with parameters n and p.

14.(a) State and prove Bayes' theorem of probability. 5+5+10=20

(b) Show that, for two events A and B that are not mutually exclusive.
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

(c) From the following data, find the regression equation which you think to be fit:

$$\sum x = 21,$$
$$\sum y = 20,$$
$$\sum x^2 = 91,$$
$$\sum xy = 74,$$
$$n = 7$$

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