RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, AUGUST 2021

FIRST YEAR [BATCH 2020-23]

Date : 12/08/2021 **ECONOMICS (HONOURS)**

Time : 11.00 am – 1.00 pm **Paper : IV [CC4]** Full Marks : 50

Answer **any six** of the following questions: [6×5]

1. Consider the function:

$$C(x,y) = \frac{1}{100}x^2 - 10x + \frac{1}{300}y^3 - 9y + 20600$$

Determine whether the function is convex or concave.

2. Show that the production function: $f(x) = -\frac{2}{3}x^3 + 10\,x^2 + 5x$ has both convex and concave sections.

3. Show that the function $f(x) = 3x + 4$ is both quasi convex and quasi concave.

4. What are the properties of Indirect Utility function?

5. Describe the price system in a 2X2 Leontief model with labour as one of the inputs. State the Hawkins-Simon condition.

6. Consider the following macroeconomic relationships:

$$S_t = \alpha Y_t$$
$$I_t = \beta(Y_t - Y_{t-1})$$
$$S_t = I_t$$

Assuming $\beta > \alpha > 0$, find the time path of Y_t for a given Y_0

7. Minimize $10x + 40y$ subject to $x^{\frac{1}{4}}y^{\frac{1}{4}} = 10$. Find the optimal demand for x and y. What amount of income is needed to be given to the individuals to attain the same level of demand if it is told to maximize the utility level subject to the given level of income?

8. Find the indirect utility function of a consumer who wants to maximize the utility function

$U = 2\left[\frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{2}y^{-\frac{1}{2}}\right]^{-2}$ subject to the budget constraint 8x+y=36

9. State and proof Roy's identity.

10. Consider the following Input-Output structure :

Sectors	Primary	Secondary	Tertiary	Final Demand	Total Output
Primary	2248	1442	336	84	4410
Secondary	27	1045	206	708	1986
Tertiary	5	69	51	36	161

Find out whether the system satisfies the Hawkins-Simon condition or not.

11. Given demand and supply for the cobweb model, find the intertemporal equilibrium price and determine whether the equilibrium is stable:

$$Q_{dt} = 18 - 3P_t$$
$$Q_{st} = -3 + 4P_{t-1}$$

12. Consider a perfectly competitive market for biscuits. The market demand and supply curves are given by : $D(p) = 100 - p$ and $S(p) = 2p$ Calculate the consumer and producer surplus at equilibrium

Answer **any two** of the following questions: [2×10]

13. Solve the following maximization problem:

max xy^2 subject to $x + y \leq 100; 2x + y \leq 120$

when (i) the first constraint is non-binding; (ii) the second constraint is non-binding (5+5)

14. i) Solve the following constrained maximization problem:

max $2x_1 + 3x_2$ subject to $2x_1^2 + 5x_2 = 10$

ii) use the second order condition to find out whether the solution is truly optimal or not. (5+5)

15. Solve the following differential equation

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} - 6y = 36$$

using the initial condition $y(0) = 10$ and $\frac{dy}{dt} = 8$ at t=0. (8+2)

16. Consider a market structure that has the demand function $Q_{dt} = 21 - 2P_t$ and the supply function$Q_{st} = -3 + 6P_t$. Firms adjust price according to the equation:

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

Provide an economic interpretation of the price adjustment equation. Find the time path of P_t and determine whether it is convergent? (2+8)

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