

END TERM EXAMINATION

FIRST SEMESTER [BBA] DEC.2014 - JAN.2015

Paper Code: BBA-105

Subject: Business Mathematics

BBA(TTM)-105

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any six questions.

Q1 (a) Prove by induction, the following. (6)

$10^n + 3.4^{n+2} + 5$ is divisible by 9.

(b) Find the value of r if ${}^{20}C_r = {}^{20}C_{r+2}$ (6.5)

Q2 (a) A committee consists of 10 members, 6 belonging to party A and 4 to party B. In how many ways can a committee of 5 to be selected so that the members of the party A are in majority. (6)

(b) Find the sum to n terms of the series 8+88+888+.... n terms. (6.5)

Q3 (a) Given below the National Income Model:- (6)

$C = a + bY$ ($a > 0, 0 < b < 1$)

$I = d + eY$ ($d > 0, 0 < e < 1$)

$Y = I + C$

Solve for the endogenous variables C, I and Y using crammers rule.

(b) Find the inverse of the matrix $\begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$ and hence solve the system of

equations: $x - y = a, y - z = b, x + z = c$. (6.5)

Q4 Given below is the transaction matrix for two industries I₁ and I₂. Find the gross output of each industry if the final demand is 80 and 40 units respectively.

Industry	Input to		Domestic demand	Total output
	I ₁	I ₂		
I ₁	30	40	50	120
I ₂	20	10	30	60

Also test the Hawkins Simon Conditions. (12.5)

Q5 (a) A monopolist has the following demand function $p = 2\left(100 - \frac{x}{4}\right)$ and the cost

function is given by $c(x) = 120x + \frac{x^2}{2}$ where p is the price per unit and x is the output. Find the most profitable output and the maximum profit. (6)

(b) If x, y and z are respectively the sum of p, q and r terms of an A.P. Show

that $\frac{x}{p}(q-r) + \frac{y}{q}(r-p) + \frac{z}{r}(p-q) = 0$. (6.5)

Q6 (a) Optimise the Utility function $U = 4xy - y^2$ subjected to the constraint $2x + y = 6$. (6)

(b) Find the maximum and minimum values of the function, $f(x) = x^5 - 5x^4 + 5x^3 - 1$. Discuss its nature at $x = 0$. (6.5)

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- Q7 → (a) A firm manufactures 5000 Air conditioners per day. It is observed the rate of change of production w.r.t additional number of workers employed (i.e. x) is given by $100 - 6x^{1/2}$. If the firm employs 16 workers more, estimate the new level of production. (6)
- (b) Find the PS if the supply curve is $P = \sqrt{9+x}$ and quantity sold is 7 units. (6.5)

- Q8 → (a) Solve: (2x3=6)

(i) $\frac{dy}{dx} = 1 + x + y + xy,$

(ii) $e^x \sqrt{1-y^2} dx + \frac{y}{x} dy = 0,$

(iii) $\frac{dy}{dx} = \frac{x^2 - 2y^2 + xy}{x^2}.$

- (b) Demand and supply functions for tea are given by

$$x_d = \left\{ 120 - 2p + 5 \frac{dp}{dt} \right\} \text{ kg per week}$$

$$x_s = \left\{ 3p - 30 + 50 \frac{dp}{dt} \right\} \text{ kg per week.}$$

Where p is the price at time t . If the initial price is 36 per kg, find the condition for dynamic equilibrium. (6.5)

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