Unique Paper Code : 235484

Name of the paper : Mathematics – II (Mathematical Methods) (Other than Economics)

Name of the Course – B. A. (H) – II

Semester : IV

Duration : 3 hours

Maximum Marks : 75

E

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

Question No. I is compulsory and carries thirty one marks.

Attempt three more questions selecting one question

from each of Sections I, II and III.

Marks are indicated against each part.

Use of scientific calculator is allowed.

(i) Find an approximate value of

$$I = \int_0^1 \sqrt{\sin x + \cos x}\ dx$$

correct to two decimal places using seven ordinates by Simpson's one third rule.   6

(ii) Find the Taylor polynomial approximation of degree 9 of the function

$f(x) = \cos x$ around the point $x = \pi$.   4

(iii) In a group of 900 persons, 500 are males, 460 males are employed and 260 females are unemployed. Can you conclude that employment status and gender are independent?   5

(iv) A coin is tossed three times. A man gets Rs. 5 for every head and loses Rs. 2 for every tail. Find his expectation.   6

(v) The standard deviation of a symmetrical frequency distribution is 3. What should be its fourth moment about the mean so that the distribution curve is mesokurtic?   4

(vi) Solve the following linear programming problem graphical method:

$$\text{Minimize } z = 3x + 4y$$

Subject to:
$$2x + y \le 40$$
$$2x + 5y \le 18050$$
$$x, y \ge 0$$

6

Section I

2. *(i)* Solve the following system of equations

$$2x + 4y + z = 3$$
$$3x + 2y - 2z = -2$$
$$x - y + z = 6$$

by using Gauss- elimination method with partial pivoting.

7

(ii) For the following system of equations

$$\begin{bmatrix} 5 & 1 & -2 \\ 3 & 4 & -1 \\ 2 & -3 & 5 \end{bmatrix} X = \begin{bmatrix} 2 \\ -2 \\ 10 \end{bmatrix}$$

(a) Set up the Gauss-Seidal iteration scheme in matrix form.

(b) Starting with $X^{(0)} = 0$, iterate two times.

8

3. *(i)* Perform five iterations of the Regula-Falsi method to obtain the root correct to three decimal places of the following equation

$$f(x) = x^4 - x + 10 = 0.$$

7

(ii) Perform four iterations of the Newton-Raphson method to obtain the approximate value of $\sqrt{17}$ starting with the initial approximation $x_0 = 2$.

8

2

Section II

4. *(i)* Ten cartons are taken at random from an automatic filling machine. The mean net weight of the 10 cartons is 15.4 Kilograms and the standard deviation is 0.88 Kilograms. Can we say that there is a significant difference of the sample mean from the intended weight of 16 Kilograms (Given degree of freedom = 9, $t_{0.05} = 2.26$.)   7

(ii) An oil exploration firm finds that 5% of the test wells it drills yield a deposit of natural gas. If the firm drills 6 well, use the Poisson distribution to find the probability that

(a) exactly 2 well   (b) at least one well, yield gas.   ($e^{-0.3} = 0.7408$)   6

(iii) A research worker wants to determine the average time it takes a machine to rotate the tyres of a car, and he wants to be able to assert with 95% confidence that the mean of his sample is off by at most 0.5 minutes. If he can presume from past experience that $\sigma = 1.6$ minutes, how large a sample will he have to take?   7

5.   *(i)* Find the coefficient of correlation between X and Y.

X	1	2	3	4	5	6	7	8	9
Y	12	11	13	15	14	17	16	19	18

10

(ii) A sample of 900 days is taken from meteorological records of a certain district and 100 of them are found to be foggy. What are the probable limits of foggy days in district?   10

Section III

6. *(i)* Solve the following linear programming problem by simplex method:

Maximize: $6x - 2y$

Subject to:
$$2x - y \leq 2$$
$$x \leq 4$$
$$x, y \geq 0$$

5

(ii) Solve the following game using dominance principle:

$$
\begin{array}{cc}
 & \text{Player II} \\
 & \begin{array}{ccc} 1 & 2 & 3 \end{array}
\end{array}
$$

$$
\text{Player I} \quad
\begin{array}{c} 1 \\ \\ 2 \end{array}
\begin{bmatrix} 6 & 8 & 6 \\ 4 & 12 & 2 \end{bmatrix}
$$

4

7. *(i)* Consider a modified form of "matching biased coins" game problem. The matching player is paid Rs. 8.00 if the two coins turn both heads and Rs. 1.00 if the coins turn both tails. The non-matching player is paid Rs. 3.00 when the two coins do not match. Given the choice of being the matching or non-matching player, which one would you choose and what would be your strategy?

6

(ii) Define slack and surplus variables.

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