Name: Enrolment No:	

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

End Semester Examination– 2022

Program: MA (Eco) **Semester: IV**

Subject/Course: Optimization II **Max. Marks: 100**

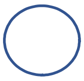
Course Code: ECON8017P **Duration: 3 Hours**

IMPORTANT INSTRUCTIONS

1. *The student must write his/her name and enrolment no. in the space designated above.*
2. *The questions have to be answered in this MS Word document.*
3. *After attempting the questions in this document, the student has to upload this MS Word document on Blackboard.*

Q.No	Section A (All are compulsory)	Marks	COs
1	The techniques of optimization include a) Marginal analysis b) Calculus c) Linear programming d) All of the above	2	CO 1
2	The equation of a straight line is 2x+3y=6. Which of the following is true of the intercept and slope of this line? a) Intercept=6, slope = 2/3	2	CO 1

	b) Intercept=2, slope = -2/3 c) Intercept=6, slope = -2/3 d) Intercept=3, slope = -2/3 e) Intercept=2/3, slope = 3		
3	What first derivative ($\frac{dy}{dx}$)of any function explains; (a)relative change in variables (change in y in relation to x) (b) absolute change in the variables (c). Both (a) & (b) (d). None of the above	2	CO 1
4	In economics, which of the following are application of optimization; a). Cost minimization (b). Profit maximization (c). Both (a) & (b) (d). None of the above.	2	CO 1
5	Which one of the following is the first derivative of log(x); (a). $\frac{1}{x}$ (b). x^2 (c). $\sqrt{x}$ (d). All of the above.	2	CO 1
6	Which expansion is represented by the following series $f(x) =$ $f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f^{(3)}(a)}{3!}(x-a)^3 + \ldots + \frac{f^{(n)}(a)}{n!}(x-a)^n + \ldots.$	2	CO 1

	(a). *Taylor expansion* (b). *Maclaurin's Series* (c). Both (a) & (b) (d). None of the above		
7	Identify convex in given options a).  (b).  (c).  (d). None of the above	2	CO 1
8	If $\pi(q)=R(q)-C(q)$(Where $\pi = profit, R = Revenue \wedge C\, is\, cost$ ¿ what is profit maximizing condition a). $\frac{d\pi}{dq}=0$ (b). $\frac{d^2\pi}{dq^2}<0$ (c). Both (a) & (b) (d). None of the above	2	CO 1
9	If $[13 \quad 13$ ¿$17 \quad 18$ ¿ ¿$]=?$ a). 0 (b). 13 (c). 11 (d). None of the above	2	CO 1
10	*Difference between the usage of symbols* $\Delta \wedge \delta$ a).Δ *is used* ¿ *denote change* $\in$ *variable having distinct values (whole numbers)*	2	CO 1

	(b). δ *is used ¿ denote change ∈ continuous variables* (c). 11 (d). None of the above		
	Section B (All are compulsory)		
1	Explain the necessary and sufficient conditions for reaching the optimal solution of any function.	5	CO 2
2	"We can reach optimal value proposition of function by using only first order (first derivative) condition" Defend the statement using appropriate example.	5	CO 2
3	Find two positive numbers whose sum is 300 and whose product is a maximum.	5	CO 2
4	Solve the following LPP; Objective Function $Z = 3x_1 + 4x_2$ Subject to $4x_1 + 2x_2 \leq 80$ $2x_1 + 5x_2 \leq 180$ $x_1, x_2 \geq 0$	5	CO 2
	Section C		
4	Write short notes on any four of the followings; i-optimization ii-objective function iii-constraints iv-decision variables v-derivatives vi-integrations	10	CO 4
5	Find the relative extrema of the function. $y = f(x) = x^3 - 12x^2 + 36x + 8$	10	CO 4
6	Explain the graphical conditions where derivative method for optimization fails. Or	10	CO 4

<table>
<tr><td></td><td>Illustrate applications of optimization technique in economics</td><td></td><td></td></tr>
<tr><td colspan="4">Section D</td></tr>
<tr><td>1</td><td>A company has three cement factories located in cities 1,2,3 which supply cements for four projects 1,2,3,4. Each plant can supply 6, 1,10 truck loads of truck daily respectively and daily cement requirement of projects are 7,5,3,2 loads of trucks. The transportation cost per truck load of cement (in hundreds of rupees) from each plant to each project site are as follows;
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>1</td><td>2</td><td>3</td><td>11</td><td>7</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>6</td><td>1</td></tr>
<tr><td>3</td><td>5</td><td>8</td><td>15</td><td>9</td></tr>
</table>

Determine the optimal distribution for company so as to minimize total transportation cost.</td><td>15</td><td>CO 5</td></tr>
<tr><td>2</td><td>Calculate the optimal solution for $z=f(x,y)=8x^3-2xy+3x^2+y^2+1$
Or
Explain utility of Hessian Matrix to find the optimal solution.</td><td>15</td><td>CO 5</td></tr>
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