UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Business Mathematics   Semester: I
Programme: BBA(DM/AM/FT/AIS/Core/E-Bus)   CC:DSQT1001
Time: 03 hrs.   Max. Marks: 100
Instructions: Section A and B all questions are compulsory. Answer any five question in section C and answer any three questions in section D.

SECTION A

S. No.		Marks	CO
Q 1	**Fill in the blanks:**	**10**	
a)	$$\int_2^{\overline{\quad}} \left(x^3 - x^2 + \frac{5}{x^2}\right) = 0$$	2	CO1
b)	If production is zero then _____ is equal to fixed cost.	2	CO1
c)	Relationship between _____ and quantity demanded is called demand function.	2	CO1
d)	$\frac{Revenue}{quantity\ sold}$ Is also called _____ function	2	CO1
e)	If for any function at x=c, first derivative is zero and second derivative is negative then at x=c function will have its _____ value.	2	CO1
Q2	**State with reasons which of the following statements is true or false:**	**10**	CO1
a)	$3x^2 - 5x^4$ is odd function.	2	CO1
b)	Sum of following series is 216 $$-\frac{1}{4} + \frac{1}{2} - 1 + 2 - 4 + 8 \dots \dots \dots \infty$$	2	CO1
c)	For given sets A,B,C $$(A \cup B) \cup C = A \cup (B \cup C)$$	2	CO1

d)	For two matrix A and B $$(A - B)' = A' * B'$$	2	CO1
e)	Derivative of a^x is also a^x where a is constant.	2	CO1

<div align="center">

SECTION B

</div>

Q 3	Compute $$3A^2 + 4A' - 7I$$ Where I is unit matrix and $$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 0 \\ 1 & -2 & 0 \end{bmatrix}$$	5	CO1
Q4	Among the 30 students of a class, 25 passed in mathematics and 23 passed in economics. If 30 students failed in both, how many students passed in both the subject.	5	CO2
Q5	Find the inverse of the matrix $$A = \begin{bmatrix} 3 & -1 & -2 \\ 2 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$$	5	CO1
Q6	Vinayak saved ₹1000 in the first years and in each year after the first he saved 1% more than he did in the preceding year. How much did he save in the 10th year?	5	CO2

<div align="center">

SECTION-C

</div>

Q 7	Find the integration of the following function $$\frac{(\log x)^2}{x}$$	6	CO1

Q8	Find the maximum and minimum value of the function. $$y = 2x^3 - 24x + 47$$	6	CO1, CO2
Q9	Find the point of inflexion on the curve and determine at that point curve changes from convex to concave (Type-I) or concave to convex(Type-II). $$y = 20 + 5x + 12x^2 - 2x^3$$	6	CO1, CO2
Q10	Evaluate $$\int \frac{(2x + 1)}{\sqrt{2x^2 + 2x + 1}} dx$$	6	CO1,
Q11	Evaluate following using integration by part $$\int x^2 e^x \, dx$$	6	CO1,
Q12	Evaluate $$\int_1^2 x \log x \, dx$$	6	CO1,
	SECTION-D		
Q13	The prices, in rupees per unit, of the three commodities X, Y and Z are x, y and z respectively. A purchases 4 units of Z and sells 3 units of X and 5 units of Y. B purchases 3 units of Y and sells 2 units of X and 1 unit of Z. C purchases 1 unit of X and sells 4 units of Y and 6 units of Z. In the process A, B and C earn ₹6000, 5000 and 13000 respectively. Using matrices, find the prices of the three commodities.	10	CO2, CO3, CO4

Q14	The total revenue received from the sale of x units of a product is given by $$R(x) = 600x - \frac{x^2}{25}$$ Find (a) The average revenue function (b) The marginal revenue function and Marginal revenue, when x=25 (c) Actual revenue from the sale of 26th unit.	10	CO2, CO3, CO4
Q15	The total cost function of a manufacturing firm is given by $$C = \frac{1}{3}x^3 - 5x^2 + 28x + 10$$ Find the output at which the marginal cost is minimum.	10	CO2, CO3, CO4
Q16	A company suffers a loss of ₹48, if its products do not sell at all. Marginal revenue and marginal cost function for the product are given by $$MR = 20 - 4x \ \ and \ MC = -10 + 2x$$ Determine (i) Profit function (ii) Break-even point (iii) Total Profit at Break-even Point	10	CO2, CO3, CO4

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Business Mathematics   **Semester: I**

Programme: BBA(DM/AM/FT/AIS/Core/E-Bus)

Time: 03 hrs.   **Max. Marks: 100**

Instructions: Section A and B all questions are compulsory. Answer any five question in section C and answer any three questions in section D.

SECTION A

S. No.		Marks	CO
Q 1	**Fill in the blanks:**	**10**	
a)	$$\int_{2}^{2}\left(x^3 - x^2 + \frac{5}{x^2}\right) = \underline{\hspace{2cm}}$$	2	CO1
b)	If production is _____ then loss is equal to fixed cost.	2	CO1
c)	Relationship between Price and quantity demanded is called_____.	2	CO1
d)	$\frac{Revenue}{quantity\ sold}$ Is also called _____ function	2	CO1
e)	If for any function at x=c , first derivative is zero and second derivative is positive then at x=c function will have its _____value.	2	CO1
Q2	**State with reasons which of the following statements is true or false:**	**10**	CO1
a)	Matrix inverse exist only when determinant is zero.	2	CO1
b)	Sum of following series is 216 $$-\frac{1}{4} + \frac{1}{2} - 1 + 2 - 4 + 8 \ldots \ldots \ldots \infty$$	2	CO1

c)	For given sets A,B,C $$(A \cup B) \cap C = A \cup (B \cap C)$$	2	CO1
d)	For two matrix A and B $$(A - B)' = A'/B'$$	2	CO1
e)	Derivative of a^x is also $a^x / \log x$ where a is constant.	2	CO1

<table>
<tr><td colspan="4" align="center">SECTION B</td></tr>
<tr>
<td>Q 3</td>
<td>Compute $$5A^2 - 3A' + 7I$$ Where I is unit matrix and $$A = \begin{bmatrix} -1 & 0 & 2 \\ 0 & 1 & -2 \\ -1 & 2 & 0 \end{bmatrix}$$</td>
<td>5</td>
<td>CO1</td>
</tr>
<tr>
<td>Q4</td>
<td>Among the 450 students of a class, 200 passed in mathematics and 300 passed in economics. If 30 students failed in both, how many students passed in both the subject.</td>
<td>5</td>
<td>CO2</td>
</tr>
<tr>
<td>Q5</td>
<td>Find the inverse of the matrix $$A = \begin{bmatrix} 3 & 2 & 1 \\ 0 & 1 & 2 \\ -2 & 1 & -1 \end{bmatrix}$$</td>
<td>5</td>
<td>CO1</td>
</tr>
<tr>
<td>Q6</td>
<td>A firm produced 2000 sets of T.V. during its first year. The total sets produced at the end of 5 years is 14000.Estimate the annual rate of increase in production if the increase in each year in uniform.</td>
<td>5</td>
<td>CO2</td>
</tr>
<tr><td colspan="4" align="center">SECTION-C</td></tr>
<tr>
<td>Q 7</td>
<td>Find the derivative of the following function $$\frac{x^2 + 3x + 1}{x^2 - x + 1}$$</td>
<td>6</td>
<td>CO1</td>
</tr>
</table>

Q8	Find the maximum and minimum value of the function $$y = \frac{1}{3}x^3 - 2x^2 + 3x + 1$$	6	CO1, CO2
Q9	Find the point of inflexion on the curve and determine at that point curve changes from convex to concave (Type-I) or concave to convex(Type-II). $$y = x^4 - 6x^2 + 8x - 1$$	6	CO1, CO2
Q10	Evaluate $$\int (x+2)\sqrt{2x^2 + 2x + 1}\, dx$$	6	CO1,
Q11	Evaluate following using integration by part $$\int (2x^3 - x^2)(6x^2 - 25)\, dx$$	6	CO1,
Q12	Using Properties of definite integral prove that $$\int_{-1}^{1} (x^3 - 5x)\, dx + \int_{-2}^{2} (16x^2 - 3x^4)\, dx$$ $$= 2\int_{0}^{2} (16x^2 - 3x^4)\, dx - \int_{-3}^{3} (12x^3 - 5x)\, dx$$	6	CO1,

SECTION-D

Q13	A salesman has the following record of sales during three months for three items which have different rate of commission.	10	CO2, CO3, CO4

Month	Sales of units			Total commission d
	A	B	C	
January	90	100	20	800
February	130	50	40	900
March	60	100	30	850

Using Matrix methods find out the rate of commission of items **A, B, and C.**

Q14	**1)** The total revenue received from the sale of x units of a product is given by $$R(x) = 200x - \frac{x^2}{5}$$ Find (a) The average revenue function (b) The marginal revenue function and Marginal revenue, when x=20 (c) Actual revenue from the sale of 21st unit.	10	**CO2, CO3, CO4**
Q15	XYZ Ltd. find that the cost of production of one unit is ₹$(\frac{x}{3} - 10)$ and the fixed cost is ₹300. Calculate the output at which the cost is minimum. Also calculate average cost and marginal cost at that output.	10	**CO2, CO3, CO4**
Q16	If, MC is marginal cost and MR is marginal revenue and $$MC = 20 + \frac{x}{30}, and\ MR = 35,$$ The fixed cost is 2500, determine the maximum profit and profit maximising level output.	10	**CO2, CO3, CO4**