Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.ARCH DEGREE EXAMINATION - NOVEMBER 2019
SUBJECT: COMPUTATION & DATA ANALYSIS (AR 1014)
(2019 SCHEME)
Monday, November 11, 2019 (10:00 - 13:00)

Marks: 50   **Duration: 180 mins.**

Answer ALL questions. Answer all parts of a question.

1A)   Demonstrate one use of maxima and one use of minima in real life scenario. Considering that   (6)
        scenario as a mathematical function, identify the variables for that scenario. Consider atleast two
        variables for each case.

1B)   Explain the mathematical process for trusting each of the variables of Q. 1A.   (4)

2) A brick manufacturing company manufactures two types of bricks A and B:
a) Bricks are sold at Rs. 25 and Rs. 20 respectively.
b) There are 2000 resource units available every day from which the brick A requires 20 units while brick B requires 12 units.
c) Bricks A and B require a production time of 4 and 6 minutes respectively.
d) Total working hours are 9 hours a day.
e) A minimum of 20 Brick A and 30 Brick B must be produced for the company to run.

2A)   Solve the problem for maxima of the cost by the following explanation: (3)
        Objective Function

2B)   Solve the problem for maxima of the cost by the following explanation: (2)
        Decision Variables

2C)   Conclude the following: (2)
        Independent Constraints

2D)   Conclude the following: (3)
        Combined Constraints

3A)   Develop a dropdown menu with respect to the selection of Brick (in dropdown menu) based upon the   (4)
        following table:

Types of Brick	Conductivity (W/m.K)	Density (kg/m3)	Price/unit (Rupees)
Burnt clay brick	0.7	100	5
Laterite brick	0.5	85	8
Concrete Block	0.8	125	7
Rammed Earth Block	0.6	95	9

3B)   Identify an Excel formula for selection of price, density and conductivity from the table based upon the   (2)
value of dropdown menu. Also apply the associated formula using syntax for input.

3C)   Also apply the associated formula using syntax for input.   (4)

4A)   **Explain the following and also use the time line to explain the same:**   (4)
i) Internal Rate of Return (IRR)
ii) Net Present Value (NPV)

4B)   Construction of a unique wall 'A' costs 550 Rupees per sq. meter while the construction of   (4)
conventional Burnt Clay Brick wall costs 450 Rupees per sq. meter. This unique wall 'A' gives the
energy saving of 10 Kwhr per sq. meter on yearly basis over burnt clay brick wall. Considering the life
of the building as 50 years and total wall area as 200 sq. meter. Make use of IRR for justifying the
decision of construction with unique wall 'A'. Extend your views for worthiness of the wall selection.

4C)   Extend your views for worthiness of the wall selection.   (2)

5A)   Optimize the cost for surface of a room which has 4 walls and roof with cement plaster finishing   (6)
(absorption coefficient = 0.3 and cost = ₹ 200 per sq. m.) and flooring of ceramic tile (absorption
coefficient = 0.2 and cost = ₹ 250 per sq. m.). This room also has some area allocated for ply board
finishing over the wall.
Equation for reverberation time (let's say f(x)) is:
(0.16 * Volume of room)/ sum of all (surface area * absorption coefficient).
f(x) falls between 1 to 3 seconds. Minimum area for ply board is 4 sq. m.
Room Dimension is 3 meter * 4 meter * 4 meter (L * W * H).

Given data:

S. No.	Ply board options	Absorption coeff. (%)	Cost (Rupees per sq. m.)
1	Option 1	0.7	200
2	Option 2	0.5	300
3	Option 3	0.9	250
4	Option 4	0.35	400

Simplify the above optimization by writing the algorithms for Excel solver with respect to Objective
Function, Variables and Constraints.

5B)   List all of the excel formulas which will be required for answering the above part (Q. 5A.). Also   (4)
mention their syntax.

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