UNIVERSITY OF RUHUNA

2018/2019 Academic Year
Bachelor of Arts (Special) Degree 2000 Level
First Semester Examination – 2019 October

STS 21633 – Operations Research

Answer any Six (06) questions.
Calculators are allowed

Time: 03 hours

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01. I. Define what is the Operations Research? (03 Marks)

  II. Discuss the importance of Operations Research? (03 Marks)

  III. Give four (04) areas of Operations Research in action. (04 Marks)

02. I. State the basic steps of a Operations Research study. (04 Marks)
  II. Write down short notes on following Operations Research tools that can be used in business and industry.
    (a) Transportation problem.
    (b) Network models.
    (c) Inventory models. (06 Marks)

03. I. What does it mean by Linear Programming? (02 Marks)

  II. State the steps of the formulation of a Linear Programming model. (02 Marks)

  III. The objective function (profit) and constrain functions of a production company are given below. This company produces two types of goods namely X_1 and X_2.
  Find the optimal product mix that maximizes the institutional profit by using graphical method.
    Objective function
      $Z = 160X_1 + 240X_2$
    Constrain functions
      $4X_1 + 2X_2 \leq 360$
      $2X_1 + 4X_2 \leq 240$
      $2X_1 + 2X_2 \leq 140$
      $X_1, 2X_2 \geq 0$ (06 Marks)

04. I. What are the assumptions based on a Linear Programming model.?

    (04 Marks)

  II. Find the optimal solution of following formulated problem using simplex method.
      $Z = 4X_1 + 3X_2$ minimize
    Subject to:-
    $2X_1 + 4X_2 \geq 16$
    $2X_1 + 2X_2 \geq 12$
    $X_1, 2X_2 \geq 0$ (06 Marks)

05. Following information are related to the project "RTS" .

Activity	predecessor	Expected Duration (weeks)	Expected cost per week (Rs 000)
A	-	2	50
B	A	10	60
C	A	4	100
D	A	5	150
E	B	5	60
F	C	8	75
G	D	8	200
H	EF	4	50
I	HG	4	100

I. Construct the project network and find the critical path. (03 Marks)
II. Calculate the minimum duration of the project. (01 Marks)
III. Calculate the project cost assuming earliest possible start and finish.

(03 Marks)

IV. Calculate the project cost assuming late start and late finish.

(03 Marks)

06. The following illustrates information of a project.

Activity	preceding Activity	Time weeks		Cost Rs:-"000"	
		Normal	Crash	Normal	Crash
A	-	14	6	2800	4400
B	-	12	8	2000	3600
C	A	18	14	3200	4000
D	A	6	4	1600	2400
E	B	4	2	800	1600
F	DE	8	6	800	1200
G	CF	18	14	1600	2400

I. What is the expected completion of the above project. (03 Marks)
II. Compute the total cost required to crash this project completely. (07 Marks)

07. I. What are the assumptions underline the Economic Order Quantity (EOQ) model?

(02 Marks)

II. There is a demand for 10000 units of product manufactured in a factory. The factory works 250 days a year and produces 100 units a day. Cost of production Rs. 20 / = per unit and the retention cost is estimated at Rs.4 / =. The cost of preparation is and average of Rs. 35 / - and it takes 1 day to complete.

a) Calculate the Economic Order Quantity for the project. (02 Marks)
b) Calculate the maximum stock level. (02 Marks)
c) Calculate the minimum annual total cost. (02 Marks)
d) How many production runs per year are needed? (02 Marks)

08. Write the short notes on each of the following topics.
a) The importance of network analysis.
b) "M" method in linear programming.
c) Critical path of the project network.
d) Transportation problem.

(2.5 x 4 =10 Marks)

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