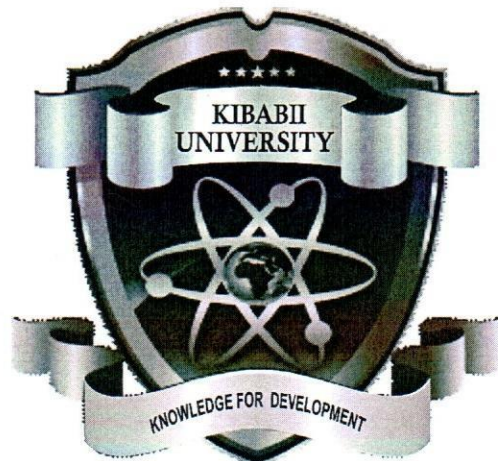


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KIBABII UNIVERSITY

2021/2022 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

MAIN EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND
BIOFUELS TECHNOLOGY

COURSE CODE: REN 224

COURSE TITLE: OPERATIONS RESEARCH

DATE: 7/10/2021

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

This paper consists of TWO sections: A and B

Section A is Compulsory. Attempt any TWO questions from section B

This paper consists of 5 printed pages. Please Turn over

SECTION B: Attempt any two questions from this section (40 MARKS)

Qn.2 A factory is manufacturing two types of paints: One for exterior purpose and the other for interior purpose:

- x_1 - exterior paint
- x_2 - interior paint
- One liter of exterior paint contributes FIVE shillings to the net profit
- One liter of interior paint contributes FOUR shillings to the net profit

To prepare the two paints, two types of raw materials are used; Raw material 1(one) and Raw material 2(two).

One liter of exterior paint requires 6 units of raw material 1 and one unit of raw material 2.

One liter of interior paint x_2 requires 4(four) units of raw material 1(one) and 2 (two) units of raw material 2(two). The maximum daily availability of raw material 1 (one) is 24 units and 6 units for raw material 2(two). x_1 cannot exceed x_2 by more than 1 (one) liter. Maximum daily demand of interior paint is 2 liters.

- (i) Formulate the Linear Programme to Maximize the profit
- (ii) Solve the Linear Programme using graphical method

(20 marks)

Qn.3 (a) A maintenance Engineer can repair four vehicles per day, where a day constitutes 8 hours. The service time distribution is assumed exponential. Determine the Probability that the service would be completed in four hours.

(b) Assume that an average of four patients arrive per hour in the emergency bay of a certain hospital. Hence, determine the probability that three patients would arrive between the hours 5.00am to 6.00am. Assume a **poissons** distribution.

(20 marks)

Qn.4 (a) Determine the shortest route for the cyclic network shown in Fig.1

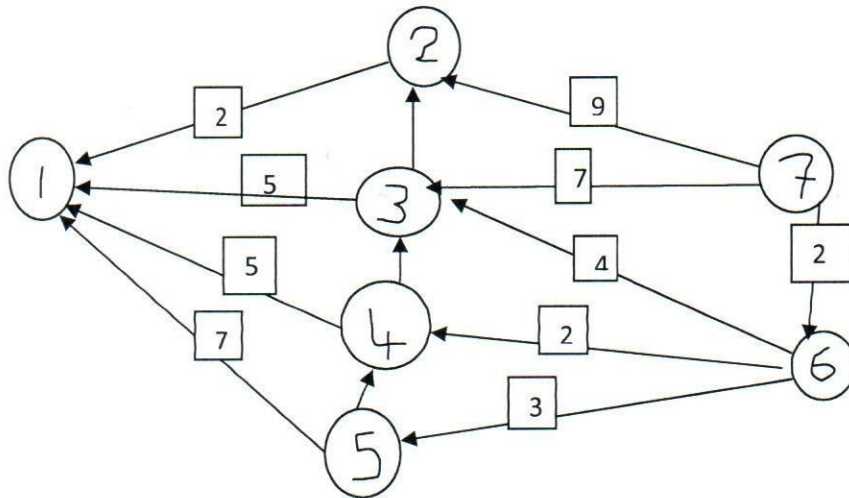


Fig.1

(16 marks)

(b) Determine the Saddle point from the Game between Player A and B as indicated in Fig.2.

B

	I	II	III	IV	V
I	-2	0	0	5	3
II	4	2	1	3	2
III	-4	-3	0	-2	6
IV	5	3	-4	2	-6

Fig.2

(4 marks)

Qn.5 John's three children: Peter, Ann and Paul want to earn some money for personal expenses. John has chosen three chores for his children: Mopping the house, Cleaning the dishes and Washing clothes. To avoid sibling competition, he invites individual secret bids for what they feel is fair pay for each of the three chores as indicated in table 1. Apply the Hungarian method to solve for a feasible solution.

	Mopping the house	Cleaning the dishes	Washing clothes
Peter	300	250	200
Ann	200	300	250
Paul	250	200	300

(20 marks)