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FACULTY OF ENGINEERING AND TECHNOLOGY
B.E.(Mech) Examination Nov/Dec 2017
Project Management and Operations Research
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) solve any three questions from each section
- ii) assume suitable data, if required
- ii) Draw neat sketches, whenever necessary.

Section A

- Q.1 a) Explain in brief the applications of operations research. 05
- b) A firm uses lathe, milling and grinding machine to make two machine parts. The table below shows the machining time required for each part, machining time available (per week) on different machines and profit on each machine part. 08
Find the no. of part- I & part-II to be manufactured per week in order to maximize the weekly profit.

Types of machine	Machine time required for the machined part (min)		Machining time available per week (min)
	Part-I	Part-II	
Lathe	12	6	3000
Milling machine	4	10	2000
Grinding machine	2	3	900
Profit per unit	Rs.40	Rs.100	

Q.2 Solve by two-phase method maximum,

13

$$Z = 4x_1 + 5x_2 - 3x_3;$$
$$\text{Subjected to, } x_1 + x_2 + x_3 = 10,$$
$$x_1 + x_2 \geq 1,$$
$$2x_1 + 3x_2 + x_3 \leq 30, \quad x_1, x_2, x_3 \geq 0$$

Q.3 Solve the following LPP by Big M Method.

13

Minimize,

$$Z = 4x_1 + x_2;$$

Subjected to,

$$\begin{aligned} 3x_1 + x_2 &= 3, \\ 4x_1 + 3x_2 &\geq 6, \\ x_1 + 2x_2 &\leq 3, \\ x_1, x_2 &\geq 0 \end{aligned}$$

Q.4 For the following transportation problem, the cell entities represent cost. Find out the optimum solution 14 and min, Transportation cost.

	1	2	3	4
A	10	0	20	11
B	12	7	9	20
C	0	14	16	18

Q.5 a) Solve the following assignment problems:

07

12	10	15	22	18	8
10	18	25	15	16	12
11	10	3	8	5	9
6	14	10	13	13	12
8	12	11	7	13	10

b) A truck owner finds from his past record that the maintenance cost per year of a truck whose purchase price is Rs.8000 are give as :

06

Year	1	2	3	4	5	6	7	8
Maintained coast	1000	1300	1700	2200	2900	3800	4800	6000
Resale price (Rs)	4000	2000	1200	600	500	400	400	400

Determine at which time it is profitable to replace the trucks.

SECTION B

- Q.6 a) A supermarket has a single cashier. During the peak hours, customers arrive at rate of 20 customers per hours. The average no. of customers that can be processed by the cashier is 24 per hour. Calculate 07
- i. The probability that the cashier is idle.
 - ii. Average no. of customers in the queuing system
 - iii. Average time a customer's spends in the system
 - iv. Average no. of customers in the queue.
- b) Explain the following queuing terms : 06
- i. Traffic intensity
 - ii. Balking
 - iii. Reneging
 - iv. Jockeying

- Q.7 a) Solve the following 3×5 game using dominance property. 07

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1

- b) Find the sequence for the following 8 jobs that will minimise the total elapsed time. Each job is processed in the order C-A-B. The processing time in hour are given below. 07

Jobs	Machines		
	A	B	C
1	4	8	5
2	6	10	6
3	7	7	2
4	4	8	3
5	5	11	4
6	3	8	9
7	6	9	15
8	2	13	11

- Q.8 a) Define inventory. What is the necessity of maintaining the inventory? 06
- b) The annual demand of an item is of 3200 unit. The cost per unit is Rs.6 and the inventory carrying charges are invested as 25% per annum. If the cost of one procurement is Rs.150. Find:- 07
- i. Economic order quantity.
 - ii. Time between the orders.

- iii. No-of orders per year.
- iv. The optimal cost.

Q.9

The following table shows activities with their three time estimates.

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- i. Draw the network and find the critical path.
- ii. What is the probability that the project will be completed:-
 - a) At least 4 weeks earlier than the expected time.
 - b) At least 4 weeks later than the expected time.
- iii. b) At least 4 weeks later than the expected time.
- iv. If the project due date is 19 weeks; what is the probability of not meeting the due date.

Activity	To	Tm	Tp
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

Z	-1.0	-1.33	1.33	0.66
P (%)	15.87	9.18	90.82	74.54

Q.10

The table below shows the normal and crash timing and the corresponding costs. The indirect cost for the project is Rs.300 per day. Draw the project. Find the optimum project duration and total min. Project cost

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Activities	Normal		Crash	
	Time (days)	Cost (Rs)	Time (days)	Cost(Rs.)
1-2	6	1400	4	1900
1-3	8	2000	5	2800
2-3	4	1100	2	1500
2-4	3	800	2	1400
3-4	0	0	0	0
2-5	6	900	3	1600
4-6	10	2500	6	3500
5-6	3	500	2	1800