Total No. of Printed Pages:4

SUBJECT CODE NO:- H-147
FACULTY OF ENGINEERING AND TECHNOLOGY
B.E. (Mechanical)
Project Management and Operations Research
(REVISED)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B
1. Solve <u>any three questions</u> from each section.
2. Assume suitable data. If required.
3. Draw neat sketches, wherever necessary.

Section A

Q.1 a) Define operations research & discuss its characteristics.   05

b) A man goes to market to purchase buttons. He needs at least 20 large buttons & at least 30   08
small buttons. The shopkeeper sells buttons in two forms,
i)   Boxes and   ii) Cards

A box contains 10 large and 5 small buttons and a card contains 2 large and 5 small buttons.
Find the most economic way in which he should purchase the buttons, if a box costs 25 paise
and a card cost 10 paise only. Solve by graphical method.

Q.2 Solve the following LPP by "Big M" method.   14
Maximize
$Z = x_1 + 2x_2 + 3x_3 - x_4$;
Subjected to,
$x_1 + 2x_2 + 3x_3 = 15$,
$2x_1 + x_2 + 5x_3 = 20$,
$x_1 + 2x_2 + x_3 + x_4 = 10$,
$x_1, x_2, x_3, x_4 \geq 0$.

Q.3 Solve by "Two Phase" method.   13
Maximize
$Z = x_1 + 2x_2 + 4x_3$;
Subjected to,
$2x_1 + x_2 + x_3 \leq 8$,
$3x_1 + 2x_2 + 3x_3 \leq 21$,
$x_1 + 2x_2 + 4x_3 \geq 26$,
$x_1, x_2, x_3 \geq 0$.

Q.4   Solve the following transportation problem for maximizing the profits. Use VAM to find the IBFS.   13

Markets

	1	2	3	4	
Factories A	42	27	24	35	200
B	46	37	32	32	60
C	40	40	30	32	140
	80	40	120	60	

Q.5   a) 5 different operators can do any of the required 5 jobs with different profits resulting from   07
each assignment given below. Find out the maximum profit through the optimum assignment

Operators

		A	B	C	D	E
	1	30	37	40	28	40
	2	40	24	27	21	36
Jobs	3	40	32	33	30	35
	4	25	38	40	36	36
	5	29	62	41	34	39

b) The cost of equipment is Rs. 62,000 and its scrap value is Rs. 2000. The life of equipment is 8   06
years. The maintenance cost for each years are given below.

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	1000	2000	3500	5000	8000	11000	16000	24000

When the equipment should be replaced?

Section B

Q.6   a) 4 Jobs are to be processed through 4 machines; M_1, M_2, M_3 and M_4. The processing time in   07
hours are given below.
Find the total elapsed time and idle time for each machine.

Machines

		M_1	M_2	M_3	M_4
	A	20	10	9	20
Jobs	B	17	7	15	17
	C	21	8	10	21
	D	25	5	9	25

b) A men's tailoring house has one tailor, specialized in men's shirts. The no of customers requiring stitching of shirts appears to follow the Poisson's distribution with a mean arrival rate of 12 per hour. Customers are attended by the tailor on first come, first served basis. The time tailor takes to attend the customers is exponentially distributed with a mean of 4 minutes. Calculate:-   06

i) The traffic intensity

ii) The probability that the queuing system idle.

iii) What is the no of customers in the shop?

iv) The average time the tailor is free on 8 hour working day.

Q.7   a) Explain in brief the following terms with respect to game theory.   08

i) Dominance property

ii) Pay-off matrix

iii) Saddle point

iv) Two person zero-sum game

b) Solve the following 3 × 4 game.   05

Player B

		1	2	3	4
Player A		3	0	-2	1
		-4	-3	-1	5
		-4	2	1	6

Q.8   a) What do you mean by economic order quantity? Explain in brief.   05

b) A stockiest has to supply 400 units of product every Monday to his customers. He gets the product at 50 Rs. Per unit, from the manufacturer. The cost of ordering & transportation from the manufacturer is Rs. 75 per order. The inventory carrying cost is 7.5% per year of the cost of the product. Find :-   08

i) EOQ

ii) No of orders per year

iii) Total optimum cost

Q.9   The following table gives the activities involved in a construction project and other related information. Draw the network and find the critical path.   13

Activity	t_o	t_m	t_p
1-2	6	9	18
1-3	5	6	17
2-4	4	7	22
3-4	4	7	16
4-5	4	10	22
2-5	4	7	10
3-5	2	5	8

Determine:-
i) The expected time and variance for each activity.
ii) The probability of completing the project in 32 days.
iii) Which duration will ensure 95% of work completion?

Z	0.40	0.41	0.42	0.43	0.44	0.68	1.65
P (%)	65.54	65.91	66.28	66.44	67.00	75.00	95.00

Q.10 The following table shows activities with their normal time, crash time and corresponding costs.   14

Assume the indirect cost per day is Rs.100. find the optimum project time and min total project cost by crashing the appropriate activities.

Activities	Normal		Crash	
	Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)
1-2	3	300	2	400
2-3	6	480	4	520
2-4	7	2100	5	2500
2-5	8	400	6	600
3-4	4	320	3	360
4-5	5	500	4	520