

MBA II Semester Supplementary Examinations December/January 2016/2017

OPERATIONS RESEARCH

(For students admitted in 2014 and 2015 only)

Time: 3 hours

Max. Marks: 60

All questions carry equal marks

SECTION – A

Answer the following: (05 X 10 = 50 Marks)

- 1 A company manufactures 2 types of printed circuits. The requirements of transistors, resistors and capacitors for each type of printed circuits along with other data are given below.

	Circuits		Stock available
	A	B	
Transistor	15	10	180
Resistor	10	20	200
Capacitor	15	20	210
Profit	Rs. 5	Rs. 8	

How many circuits of each type should the company produce from the stock to earn maximum profit?

OR

- 2 Minimize $Z = x_1 - 3x_2 + 2x_3$
 Subjected to $3x_1 - x_2 + 3x_3 \leq 7$
 $-2x_1 + 4x_2 \leq 12$
 $-4x_1 + 3x_2 + 8x_3 \leq 10$ and $x_1, x_2, x_3 \geq 0$

- 3 Determine an initial basic solution to the following transportation problem using:
 (i) North west corner rule. (ii) Vogel's approximation method.

		Destination					Supply
		A ₁	B ₁	C ₁	D ₁	E ₁	
Origin	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
Demand		3	3	4	5	6	

OR

- 4 Solve the assignment problem for maximization for the given profit matrix (profit in rupees).

		Machines			
		P	Q	R	S
Job	A	51	53	54	50
	B	47	50	48	50
	C	49	50	60	61
	D	63	64	60	60

- 5 Solve the following 2 x 2 game.

$$\begin{matrix} & B \\ A & \begin{bmatrix} 2 & 5 \\ 7 & 3 \end{bmatrix} \end{matrix}$$

OR

- 6 Find the sequence that minimizes the total elapsed time required to complete the following jobs on machines M₁, M₂ and M₃. Also find the minimum total elapsed time and the idle times on the machines.

Task	A	B	C	D	E	F
M ₁	8	3	7	2	5	1
M ₂	3	4	5	2	1	6
M ₃	8	7	6	9	10	9

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- 7 At a one – man barber shop, the customers arrive by following Poisson at an average rate of 5 per hour and they are served according to exponential distribution with an average service rate of 10 minutes. Assuming that only 5 seats are available for waiting customers, find the average time a customer spends in the system.

OR

- 8 At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while the other is given signal to leave the station. Trains arrive at the station at average rate of 6 per hour and railway station can handle them on an average 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady state probabilities of various number of trains in the system. Also find the average waiting time of a new train coming into the yard.

- 9 Determine the optimum project duration and cost for the project given below.

Activity	Normal		Crash	
	Time (days)	Cost (Rs)	Time (days)	Cost (Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

Overhead is Rs. 70/- per day.

OR

- 10 Electronic equipment has a large number of integrated circuit chips (IC chips). The following mortality rates of IC chips have been observed and recorded below:

Period	Failure tenure (in hours)	Probability of failure
1	0 - 100	0.08
2	101 - 200	0.16
3	201 – 300	0.45
4	301 – 400	0.22
5	400 - 500	0.09

If the IC chips are replaced as groups, the cost of replacement is INR 20 per IC chip. It is proposed to replace all IC chips at fixed intervals of time, whether or not they have failed, and also to continue replacement as the chips fail. Replacement of IC chips can be done individually at the cost of INR 70 per IC chip. How frequently the IC chip should be replaced?

SECTION – B

(Compulsory Question)

01 X 10 = 10 Marks

- 11 **Case study/Problem:**

Solve by two-phase simplex method:

$$\text{Maximize } Z = -4x_1 - 3x_2 - 9x_3$$

$$\text{Subjected to } 2x_1 + 4x_2 + 6x_3 = 15$$

$$6x_1 + x_2 + 6x_3 = 12$$

$$x_1, x_2, x_3 \geq 0$$
