

Reg.No. \_\_\_\_\_



# Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)  
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

## End Semester Examination – Nov/Dec – 2016

Code : **14MA2018**  
Sub. Name : **Operations Research II**

Semester : **2016-17 ODD**  
Duration : **3hrs**  
Max. marks : **100**

### ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	A tyre manufacturer has to supply 12000 tyres per year to an automobile industry. The demand is fixed and known. Shortage cost is assumed to be infinite. The inventory holding cost is Rs.0.15/month and the setup cost per run is Rs.325. Determine the following: i) The optimum run size, ii) Optimum scheduling period iii) Minimum total expected yearly cost.	CO1	9
	b.	Explain the steps in ABC analysis of inventory.	CO1	5
	c.	The demand for a small electronic component is at the rate of 7000 units. The cost of a single component is Rs.1.25 and the inventory carrying cost is 20%. For placing an order, it costs Rs.50. Determine: i) EOQ ii) Total inventory carrying cost iii) Total ordering cost.	CO1	6
(OR)				
2.	a.	The demand for a computer monitor cable is 1050 cables per month and shortages are allowed. If the cost per cable is Rs.125, cost of making one purchase is Rs.700, the holding cost of one cable is Rs.3 per year and cost of one shortage is Rs.50 per year. Determine the following: i) Optimum purchase quantity ii) Optimum number of shortages iii) Optimum total yearly cost iv) Number of orders per year v) Time between order vi) Maximum inventory.	CO1	12

	b.	A machine tool manufacturing company has a demand for oil seals at the rate of 15000 oil seals/year. It can produce 2500 oil seals per month. The cost of one setup is Rs.550 and the inventory holding cost is Rs.0.25/oil seals/month. The cost per oil seal is Rs.5. Determine: i) Optimum lot size ii) Maximum inventory iii) Total time iv) Total cost per year	CO1	8																													
3.	a.	The activities involved in a project with their respective time estimates are given in the table (in weeks) <table border="1"><thead><tr><th>Activity</th><th>1-2</th><th>1-3</th><th>2-3</th><th>3-4</th></tr></thead><tbody><tr><td>t<sub>o</sub></td><td>1</td><td>2</td><td>2</td><td>3</td></tr><tr><td>t<sub>m</sub></td><td>1</td><td>5</td><td>2</td><td>6</td></tr><tr><td>t<sub>p</sub></td><td>7</td><td>14</td><td>14</td><td>15</td></tr></tbody></table> i) Find the expected duration and variance of the project. ii) What is the probability that the project will be completed atleast 2 weeks later than expected? iii) What is the probability of the entire project?	Activity	1-2	1-3	2-3	3-4	t <sub>o</sub>	1	2	2	3	t <sub>m</sub>	1	5	2	6	t <sub>p</sub>	7	14	14	15	CO2	15									
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	b.	Explain briefly about CPM technique.	CO2	5																													
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4.	a.	The normal cost and duration, crash cost and duration of activities of a project are given in the table. If the overhead cost is Rs.45 [er day, determine the optimal cost schedule for the project by drawing the project schedule vs total cost. <table border="1"><thead><tr><th rowspan="2">Activity</th><th colspan="2">Normal</th><th colspan="2">Crash</th></tr><tr><th>Cost</th><th>Duration</th><th>Cost</th><th>Duration</th></tr></thead><tbody><tr><td>1-2</td><td>360</td><td>3</td><td>440</td><td>1</td></tr><tr><td>2-3</td><td>240</td><td>4</td><td>320</td><td>2</td></tr><tr><td>2-4</td><td>100</td><td>7</td><td>140</td><td>3</td></tr><tr><td>3-4</td><td>80</td><td>5</td><td>140</td><td>2</td></tr></tbody></table>	Activity	Normal		Crash		Cost	Duration	Cost	Duration	1-2	360	3	440	1	2-3	240	4	320	2	2-4	100	7	140	3	3-4	80	5	140	2	CO2	16
Activity	Normal			Crash																													
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1-2	360	3	440	1																													
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2-4	100	7	140	3																													
3-4	80	5	140	2																													
	b.	Explain briefly the various terminologies in PERT.	CO2	4																													
5.	a.	The demand per day for a belt used in the engine of an automobile has the following probability distribution. Simulate the demand for 20 days. <table border="1"><thead><tr><th>Demand/day</th><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></thead><tbody><tr><th>Probability</th><td>0.10</td><td>0.30</td><td>0.30</td><td>0.20</td><td>0.10</td></tr></tbody></table>	Demand/day	3	4	5	6	7	Probability	0.10	0.30	0.30	0.20	0.10	CO3	10																	
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Probability	0.10	0.30	0.30	0.20	0.10																												
	b.	In a big textile mill, trucks loaded with raw cotton arrive at a rate of of 12 trucks	CO2	10																													

		per day. Assuming that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average 34 minutes. Determine the following: i) Mean line length ii) Probability that the queue size exceeds 12																						
(OR)																								
6.	a.	In a concern, the sales per day is Poisson with mean 6.5. Genarate 15 days of sales by Monte Carlo method.	CO3	10																				
	b.	Arrival at a public telephone booth are considered to be Poisson with an average time of 8 minutes between one arrival and the next. The length of he telephone calls is assumed to be exponentially distributed with a mean value of 2 minutes. i) What will be the probability that a person arriving at the booth will have to wait? ii) Determine the average queue length that is formed from time to time. iii) The telephone department is interested to install a second booth if convinced that an arrival would expect to have to wait atleast 5 minutes for the phone. Determine the increase in flow of arrivals which will justify a second booth.																						
7.	a.	Solve the game whose pay off matrix is as follows: (Player A vs Player B) <table border="1"><tr><td></td><td>B1</td><td>B2</td><td>B3</td><td>B4</td></tr><tr><td>A1</td><td>-5</td><td>2</td><td>0</td><td>7</td></tr><tr><td>A2</td><td>5</td><td>6</td><td>4</td><td>8</td></tr><tr><td>A3</td><td>4</td><td>0</td><td>2</td><td>-3</td></tr></table>		B1	B2	B3	B4	A1	-5	2	0	7	A2	5	6	4	8	A3	4	0	2	-3	CO2	10
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A3	4	0	2	-3																				
	b.	Consider the game ‘G’, with the following pay off matrix. (Player P vs Player Q) <table border="1"><tr><td>2</td><td>8</td></tr><tr><td>-2</td><td>M</td></tr></table> i) Show that ‘G’ is strictly determinable, whatever ‘M’ may be. ii) Determine the value of the game ‘G’.	2	8	-2	M	CO2	10																
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-2	M																							
(OR)																								
8.	a.	On the following pay off matrix, determine the saddle point. (Player A vs Player B) <table border="1"><tr><td></td><td>B1</td><td>B2</td></tr><tr><td>A1</td><td>-3</td><td>3</td></tr><tr><td>A2</td><td>-2</td><td>4</td></tr><tr><td>A3</td><td>2</td><td>3</td></tr></table>		B1	B2	A1	-3	3	A2	-2	4	A3	2	3	CO2	10								
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		<b><u>Compulsory:</u></b>																		
9.	a.	<p>The owner of a stone crushing machine determines from his past records that the cost per year for operating the machine is as shown in the table. The purchase price of this machine was Rs.65000 when new.</p> <table><tr><td>Age</td><td>1</td><td>2</td><td>3</td></tr><tr><td>Operating cost in Rs</td><td>10000</td><td>12000</td><td>14000</td></tr></table> <p>After 3 years, the operating cost is Rs.4000 B, where B=4,5,6 (B indicating age in years). If the resale value decrease by 15 percent of the purchase price every year, what is the optimal replacement policy?</p>	Age	1	2	3	Operating cost in Rs	10000	12000	14000	CO2	10								
Age	1	2	3																	
Operating cost in Rs	10000	12000	14000																	
	b.	<p>A hand grinding machine (Type A) costs Rs.9500. Annual operating costs are Rs.220 for the first year and it increases by Rs.1900 every year. Find the optimal age at which the hand grinding machine of type A is to be replaced along with the corresponding average yearly cost of owning and operating it. Assume that the machine has no resale value and future costs are not discounted.</p> <p>Another hand grinding machine (Type B) costs Rs.10500. Annual operating costs are Rs.410 for the first year and it increases by Rs.820 every year. There is one hand grinding machine of Type A which is one year old in the industry. Should it be replaced with hand grinding machine of Type B?</p>	CO2	10																

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