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



**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**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14MA2018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Operations Research II** | **Max. marks :** | **100** |

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

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| **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)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Activity** | **1-2** | **1-3** | **2-3** | **3-4** | | to | 1 | 2 | 2 | 3 | | tm | 1 | 5 | 2 | 6 | | tp | 7 | 14 | 14 | 15 |   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? | | CO2 | 15 |
|  | b. | Explain briefly about CPM technique. | | CO2 | 5 |
| (OR) | | | | | |  |  |
| 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.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **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 |
|  | 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.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Demand/day** | 3 | 4 | 5 | 6 | 7 | | **Probability** | 0.10 | 0.30 | 0.30 | 0.20 | 0.10 | | | CO3 | 10 |
|  | b. | In a big textile mill, trucks loaded with raw cotton arrive at a rate of of 12 trucks 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 | | CO2 | 10 |
| (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)   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | B1 | B2 | B3 | B4 | | A1 | -5 | 2 | 0 | 7 | | A2 | 5 | 6 | 4 | 8 | | A3 | 4 | 0 | 2 | -3 | | | CO2 | 10 |
|  | b. | Consider the game ‘G’, with the following pay off matrix. (Player P vs Player Q)   |  |  | | --- | --- | | 2 | 8 | | -2 | M |   i) Show that ‘G’ is strictly determinable, whatever ‘M’ may be.  ii) Determine the value of the game ‘G’. | | CO2 | 10 |
| (OR) | | | | | |
| 8. | a. | On the following pay off matrix, determine the saddle point.  (Player A vs Player B)   |  |  |  | | --- | --- | --- | |  | B1 | B2 | | A1 | -3 | 3 | | A2 | -2 | 4 | | A3 | 2 | 3 | | CO2 | | 10 |
|  | b. | Solve the game whose pay off matrix is as follows: (Player A vs Player B)   |  |  |  |  | | --- | --- | --- | --- | |  | B1 | B2 | B3 | | A1 | -2 | 16 | -2 | | A2 | -5 | -8 | -4 | | A3 | -5 | 20 | -9 | | CO2 | | 10 |
|  | | **Compulsory:** |  | |  |
| 9. | a. | The owner of a stone crushing machine determines fom 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.   |  |  |  |  | | --- | --- | --- | --- | | **Age** | 1 | 2 | 3 | | **Operating cost in Rs** | 10000 | 12000 | 14000 |   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? | CO2 | | 10 |
|  | b. | 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.  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? | CO2 | | 10 |

ALL THE BEST