**JAIPURIA INSTITUTE OF MANAGEMENT, INDORE**

**PGDM SECOND TRIMESTER (Batch 2019-21)**

**END TERM EXAMINATION, DECEMBER-2019**

|  |  |  |  |
| --- | --- | --- | --- |
| Course Name | **Operations Management**  | Course Code | **OM 201** |
| Max. Time | **2 hours** | Max. Marks | **40** |

**Q.1.** High Tensile Springs Limited is a manufacturer of high tensile springs which are used in automobile and OEM sectors. These springs require steel rods as raw material. The annual demand of these rods is 120,000 MT and the ordering cost is Rs 1000 per order. The carrying cost is Rs 100 per ton per month. Each ton of the steel rod costs Rs 36,000. Analyze above information.  **(10 Marks)**

1. Find out the EOQ and total cost of inventory for High Tensile Springs Limited.
2. The supplier as offered a discount of Rs 2000 per ton if order quantity is more than 500 MT per order. Should this discount be availed?

**Ans.** Given,

 Annual Demand D = 120,000

 Ordering Cost per order S = 1000

 Holding or carrying cost per unit per year H = 100 x 12 = 12000/Year

 Unit Price C = 36,000

**EOQ = (2DS/H)1/2**

 EOQ = 447.213 MT

**Total cost TC = DC + (D x S)/EOQ + (EOQ x H)/2**

 Total cost = 120000 x 36000 + 120000 x 1000/447.21 = 447.21 x 1200/2 = 4,320,536,656.3

**Discount offer scenario: -**

The minimum order quantity is 500 MT per order. Total cost for this option is

Total cost = 120000 x 34000 + 120000 x 1000/500 + 500 x 1200/2

 = 4,080,540,000

There is substantial savings (4,320,536,656.3 – 4,080,540,000 = Rs. 239,996,656.3)

So, Discount should be availed.

**Q.2.** “Superstar Electricals” manufactures different type of electrical appliances. The tasks for making an electric Iron are tabulated below. The company operates in two shifts each of 8 hours, and workers take a 30 minutes’ lunch break in each shift when the production is stopped. The desired output is 900 electric Irons per day. Apply operations management concepts on situation below.

* Draw precedence diagram.
* Use largest task time as a primary rule to balance this production line. Determine the performance parameter (Line Efficiency).  **(6 Marks)**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task | A | B | C | D | E | F | G | H | I | J | K |
| Task Precedence | - | A | A | A | B | C | D,E,F | G | G | H,I | J |
| Task Time in seconds | 20 | 40 | 35 | 35 | 25 | 20 | 40 | 15 | 45 | 10 | 50 |

D

A

C

K

I

G

H

J

E

F

B

Cycle Time = (8 x 2 x 60 x 60) – (2 x 30 x 60) / 900

 = (57600 – 3600) / 900

 = 60 seconds

Students should group tasks in different work stations as under: -

|  |  |  |  |
| --- | --- | --- | --- |
| **Work Station** | **Tasks Allocated** | **Station Time****(Seconds)** | **Remaining Time****(Seconds)** |
| 1 | A + B | 60 | 0 |
| 2 | C + E  | 60 | 0 |
| 3 | D + F | 55 | 5 |
| 4 | G + H | 55 | 5 |
| 5 | I + J | 55 | 5 |
| 6 | K | 50 | 10 |

**Line Efficiency = ∑ Task Time x 100/ Na x Cycle Time** (Na = actual number of work stations)

 **=** 335 x 100 / (6 x 60)

 = 93.055 %

**Q.3** There are six stages in a semi-automated process and the relevant details are given:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Step 1****(20 seconds)** | **Step 2****(45 seconds)** | **Step 3****(10 seconds)** | **Step 4****(20 seconds)** | **Step 5****(5 seconds)** | **Step 6****(10 seconds)** |

Use this information to answer the following questions:  **(8 Marks)**

1. Determine time it will take to respond to an arriving order.
2. Determine daily production if the system works for 8 hours every day.
3. Determine utilization of each resource in the system.
4. Explain steps to increase the production by 25%.

**Ans.**

1. An arriving order shall be completed in 110 Seconds for the first unit (cycle time is 45 Seconds for subsequent units.)
2. Total time available per day = 8 x 60 x 60 = 28,800 Seconds. Then, daily production possible is 28800 / 45 = 640 Units.
3. Resources utilization: -

|  |  |  |  |
| --- | --- | --- | --- |
| **Operations Step** | **Max. capacity** | **Actual Output** | **Capacity Utilization****(%)** |
| Step 1 | (8\*60\*60)/20 = 1440 | 640 | 640\*100/1440 = 44.38 |
| Step 2 | (8\*60\*60)/45 = 640 | 640 | 640\*100/640 = 100.00 |
| Step 3 | (8\*60\*60)/10 = 2880 | 640 | 640\*100/2880 = 22.22 |
| Step 4 | (8\*60\*60)/20 = 1440 | 640 | 640\*100/1440 = 44.38 |
| Step 5 | (8\*60\*60)/5 = 5760 | 640 | 640\*100/5760 = 11.11 |
| Step 6 | (8\*60\*60)/10 = 2880 | 640 | 640\*100/2880 = 22.22 |

 *(Assumption that there is NO stoppage during 8 hours and that the work in progress inventory is completed within the same day even if it requires a little extra time i.e. few seconds above 8 hours.* Student can also consider complete units’ production output without above assumption and calculate the output, capacity utilization etc.)

1. Time of “Step 2” need to be reduced by 25 % to increase production by 25 %. It can be done by allocating additional resources (additional machine) or by splitting task at “Step 2” if possible.

**Q.4.** Stylish Garments is a new garment manufacturing unit which is planning to produces four different type of female garments. The garment manufacturing unit has eight departments numbered from 1-8. Each manufacturing department is 10 x 10 Meters. The garments pass through these departments as per sequence given below. The operations manager has two layouts in mind for this new manufacturing facility, as under**: - (8 Marks)**

|  |  |  |
| --- | --- | --- |
| **Layout Y** |  | **Layout Z** |
| 7 | 4 | 8 | 1 |  | 2 | 4 | 7 | 5 |
| 5 | 6 | 3 | 2 |  | 1 | 3 | 8 | 6 |

The four different type of garments are manufactured in different departments as per sequence given below: -

|  |  |  |
| --- | --- | --- |
|  Garment Type | Monthly demand (Units) | Manufacturing departments sequence |
| A | 1000 | 1-2-4-7-8 |
| B | 4000 | 1-3-5-6-8 |
| C | 2500 | 1-4-5-6-8 |
| D | 3000 | 1-2-4-6-8 |

Compare both the layouts and suggest which layout is better?

Ans. Comparison of both the layouts for Load x Distances is as under: -

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Garment****Type** | **Monthly demand (Units)** | **Manufacturing departments sequence** | **Movement per unit****in****Layout Y** | **Total Movement in****Layout Y** |  | **Movement per unit** **in****Layout Z** | **Total Movement in****Layout Z** |
| A | 1000 | 1-2-4-7-8 | 10+30+10+20 = 70 | 70 x 1000 = 70,000 |  | 10+10+10+10 = 40 | 40 x 1000 = 40,000 |
| B | 4000 | 1-3-5-6-8 | 20+20+10+20 = 70 | 70 x 4000 = 280,000 |  | 10+30+10+10 = 60 | 60 x 4000 = 240,000 |
| C | 2500 | 1-4-5-6-8 | 20+20+10+20 = 70 | 70 x 2500 = 175,000 |  | 20+20+10+10 = 60 | 60 x 2500 = 150,000 |
| D | 3000 | 1-2-4-6-8 | 10+30+10+20 = 70 | 70 x 3000 = 210000 |  | 10+10+30+10 = 60 | 60 x 3000 = 180,000 |

 *(All distances are in Meters)*

Total material movement in Layout Y is = 735,000 meters

Total material movement in Layout Z is = 610,000 meters

**Thus, Layout Z is better.**

**Q.5.** Read the small case study about the process design of Boeing's 777 aircraft: **(8 Marks)**

Boeing brings its customers on board Arguably the most innovative new passenger aircraft to enter service over the last few years was the Boeing 777, a new twin-engined aircraft, in the 300-plus seats category to compete with established models from McDonnell and Airbus. The existence of established competitor products is important. When Boeing developed the 747 'Jumbo' jet aircraft, it had no direct competitors. The company's customers either wanted the product or they didn't. Not so for the 777; Boeing knew that it must consider its customers' requirements.

The company had to take a new course - to understand its customers' needs and then to transform that knowledge into an aircraft that could best meet those needs. Boeing has always maintained close involvement with its customers, but this project called for a new depth of listening and understanding. Initially, eight large potential customers (including British Airways, Japan Airlines and Qantas) were invited to participate in creating the design concepts. It soon became clear that the customers did have important requirements, the most vital of which was that the aircraft should be around 25 per cent wider than the 767. In fact, Boeing had originally hoped to lengthen the 767 fuselage to give the extra capacity, so avoiding some of the costs involved in a completely new fuselage. The customers also wanted much more flexibility in the configuration of the passenger space. Conventionally, cabin space had been divided up into sections, separated by fixed galleys and toilets at predetermined positions, fixing the ratio of passenger capacities of each class. However, the airlines all indicated that they wanted to be able to configure the cabin to their own requirements. Finally, the airlines insisted that the new design should be free of the usual level of minor, but irritating, faults which had bugged the early operations of some of the other aircraft. Boeing did meet its customers' requirements and even improved upon them in some ways. They achieved this by using design/build teams, and by a particularly powerful computer-aided design (CAD) system. Customers were closely involved right from the start of the design. They even came up with some good suggestions. For example, one airline suggested a new layout for the rear galley which allowed an extra 12 seats to be included in the aircraft.

**Answer the following questions:**

**a)** Explain steps Boeing need to take for improving service quality.

**b)** Explain problems which might be associated with bringing customers together.

**c)** Illustrate various layout decisions Boeing took for improving the services.

**Ans.** Students are required to explain steps for improving service quality and problems in bringing customer together, as the customer may share each other’s issues and may create a negative word of mouth etc. They should use Layout concepts to answer these questions.