UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Lean Manufacturing **Semester: III**
Program: MBA OPR **Duration: 3 hours**
Course Code: **LSCM 8018** **Max. Marks: 100**
Instructions: As per sections

SECTION A (20 Marks)
(Type the answers in test box)

S. No.	**Attempt all questions in this section**	**Marks**	**CO**
	Explain the following and fill in the blank		
Q 1	Heijunka	2	CO 1
Q 2	Jidoka	2	CO 1
Q 3	SMED	2	CO 1
Q 4	Little's law	2	CO 1
Q 5	OEE	2	CO 1
Q 6	Zero Inventory	2	CO 1
Q 7	If takt time is 34.3 sec. & OEE is 88% what would be the cycle time? ……	2	CO 1
Q 8	Model mix leveling	2	CO 1
Q 9	MSA	2	CO 1
Q 10	Poka Yoke	2	CO 1

SECTION B (20 Marks)

	Attempt all questions	**Marks**	**CO**
Q 1	Discuss the seven deadly wastes/sins?	5	CO 2
Q 2	Compare lean principles with TPS principles?	5	CO 2
Q 3	What do you understand by 5s & how it can be used in any manufacturing setup?	5	CO 1
Q 4	Discuss the various manufacturing strategies and how they are linked with delivery lead time?	5	CO 2

SECTION-C(30 Marks)

	Attempt all questions in this section	**Marks**	**CO**
Q 1	Calculate the OEE for 31st March 2021, where a plant runs for two shift of 12 hours each everyday & each shift has a break of 1 hour & 30 min. each for lunch & dinner & tea break. The scheduled preventive maintenance is 30 min. each day. The unscheduled downtime was 1 hour on 31st March 2021. The design cycle time is 30 seconds per piece & the total production was 2050 pieces with 50 rejected pieces on that particular day. Also predict the type of losses using OEE?	10	CO 3
Q 2	A projector manufacturing company exports projector, calculate the cycle, buffer & safety stock for the company when their daily shipment is 1400 units per day,	10	CO 3

	assume takt time as 1 minute. The time the Kanban cards are in planning is 24 hours, and the delivery time (due to material handler's frequency) is 3 hours. In any typical queue they have 14 hours of demand in front of the order. Assuming safety factor as 0.03, also the average production is 1400 units for a month & standard deviation is 59.0 & average demand for a month is 1400 units & standard deviation for demand is 208.0. For a 99% on time delivery the acceptable value for one sided test (Z score= 2.33). Also calculate the number of kanban required when the kanban container size is 50 units.		
Q 3	A company is setting up an assembly line to produce 192 units per 8-hour shift. The following table identifies the work elements, times, and immediate predecessors: a. What is the desired cycle time (in seconds)? b. What is the theoretical minimum number of stations? c. Assign tasks to each workstation d. Compute the efficiency **OR** Discuss the various diagnostic tools used for Lean strategy implementation?	10	CO 2

Work element	Time(Sec)	Immediate Predecessor
A	40	None
B	80	A
C	30	D, E, F
D	25	B
E	20	B
F	15	B
G	120	A
H	145	G
I	130	H
J	115	C.I

SECTION-D(30 Marks)

	Read the case and attempt both questions	**Marks**	**CO**
	Orlando's Arnold Palmer Hospital, founded in 1989, specializes in treatment of women and children and is renowned for its high quality rankings (top 10% of 2000 benchmarked hospitals), its labor and delivery volume (more than 14,000 births per year), and its neonatal intensive care unit (one of the highest survival rates in the nation). But quality medical practices and high patient satisfaction require costly inventory—some $30 million per year and thousands of SKUs. With pressure on medical care to manage and reduce costs, Arnold Palmer Hospital has turned toward controlling its inventory with just-in-time (JIT) techniques. Within the hospital, for example, drugs are now distributed at the nursing stations via dispensing machines (almost like vending machines) that electronically track patient usage and post the related charge to each patient. Each night, based on patient demand and prescriptions written by doctors, the dispensing stations are refilled. To address JIT issues externally, Arnold Palmer Hospital turned to a major distribution partner, McKesson General Medical, which as a first-tier supplier provides the hospital with about one-quarter of all its medical/surgical inventory. McKesson supplies sponges, basins, towels, Mayo stand covers, syringes, and hundreds of other medical/surgical items. To ensure coordinated daily delivery of inventory purchased from McKesson, an account executive has been assigned to the hospital on a full-time basis, as well as		

	two other individuals who address customer service and product issues. The result has been a drop in Central Supply average daily inventory from $400,000 to $114,000 since JIT. JIT success has also been achieved in the area of custom surgical packs. Custom surgical packs are the sterile coverings, disposable plastic trays, gauze, and the like, specialized to each type of surgical procedure. Arnold Palmer Hospital uses 10 different custom packs for various surgical procedures. "Over 50,000 packs are used each year, for a total cost of about $1.5 million," says George DeLong, head of Supply-Chain Management. The packs are not only delivered in a JIT manner, but packed that way as well. That is, they are packed in the reverse order they are used so each item comes out of the pack in the sequence it is needed. The packs are bulky, are expensive, and must remain sterile. Reducing the inventory and handling while maintaining an ensured sterile supply for scheduled surgeries presents a challenge to hospitals. Here is how the supply chain works: Custom packs are assembled by a packing company with components supplied primarily from manufacturers selected by the hospital, and delivered by McKesson from its local warehouse. Arnold Palmer Hospital works with its own surgical staff (through the Medical Economics Outcome Committee) to identify and standardize the custom packs to reduce the number of custom pack SKUs. With this integrated system, pack safety stock inventory has been cut to one day. The procedure to drive the custom surgical pack JIT system begins with a "pull" from the doctors' daily surgical schedule. Then, Arnold Palmer Hospital initiates an electronic order to McKesson between 1:00 and 2:00 p.m. daily. At 4:00 a.m. the next day, McKesson delivers the packs. Hospital personnel arrive at 7:00 a.m. and stock the shelves for scheduled surgeries. McKesson then reorders from the packing company, which in turn "pulls" necessary inventory for the quantity of packs needed from the manufacturers. Arnold Palmer Hospital's JIT system reduces inventory investment, expensive traditional ordering, and bulky storage and supports quality with a sterile delivery.		
Q1	What do you recommend be done when an error is found in a pack as it is opened for an operation? & How might the procedure for custom surgical packs described here be improved?	**15**	CO 2
Q 2	When discussing JIT in services, the text notes that suppliers, layout, inventory, and scheduling are all used. Provide an example of each of these at Arnold Palmer Hospital.	**15**	CO 3