

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2022-23
MSE G521 WORLD CLASS MANUFACTURING
COMPREHENSIVE EXAMINATION (Open Book)

Duration: 3 Hrs

17-12-2022

Marks: 40

Q1 (a) List the benefits of employee empowerment and problems of disempowerment. Also, explain The factors important for successful empowerment. [5]

(b) Do you think Jidoka and TQM are similar? Justify your answer. [5]

Q2 (a) What are the limitations of traditional performance measures? How do the researchers develop the performance measurement systems for the measurements of the performance of WCM organizations? Explain it with suitable examples. [5]

(b) The following information was obtained from press shop of TATA Motors company which works for three shifts of 8 hours each. In each shift workers are provided scheduled break of 45 Min. for lunch and tea. A typical analysis of average unplanned downtime per shift revealed that at least 2 breakdowns are happening which accounted for a lost time of about 55 mins and atleast one setup was carried out which consumed at least 25 mins. In addition to this minor breakdowns like tool resharpening, waiting for material etc. constituted around 5 mins. Each component was produced at a rate of 8 sec and on an average each shift was producing around 1821 parts out of which around 15 parts are scrapped and 35 were sent for rework.

- (i) Identify the different losses for the press shop.
- (ii) Calculate OEE for the Press shop. [2]

(c) Suppose a group of 25 identical machines is monitored for 5 months, and without preventive maintenance (PM) the number of breakdowns in each month is as follows

Months of operation before breakdown, n	1	2	3	4	5
No. of breakdowns, b	3	4	3	5	10

This indicates that longest time a machine runs before the breaking down is 5 months, and that, for example, 4 machines ran 2 months before they broke down. Cost of repairing the machine after breakdown is Rs 500 (CB), Where as cost of PM on a machine is Rs 100 (Cp). PM does not eliminate breakdown.

- Calculate (1) What is the monthly cost of breakdowns?
- (2) If PM used, how often should it be done? [3]

Q3 (a) List any four manufacturing related and four non-manufacturing-related criteria used for order winners and qualifiers by smartphone manufacturers. [4]

(b) BITS Pilani wish to purchase a new car for Vice Chancellor, for this purpose they selected high-End cars from four different manufacturers TATA, Honda, Toyota and Maruti Suzuki on the basis of four criteria Comfort, Maintenance cost, services and Fuel Efficiency. Weightage to the criteria has been assigned after discussing with the users and decision makers. Following Table 1 shows the comparison of each criterion with each other on Saaty's scale and Table 2 shows the comparison of each alternative with criteria on 1-9 Scale where 1 is Poor and 9 is Excellent.

Table 1: Comparison Matrix of Criteria

	Comfort	Service	Maintenance Cost	Fuel Efficiency
Comfort	1	3	5	4
Service	1/3	1	4	3
Maintenance Cost	1/5	1/4	1	1/2
Fuel Efficiency	1/4	1/3	2	1

Table 2: Comparison Matrix of Alternatives and Criteria

	Comfort	Service	Maintenance Cost	Fuel Efficiency
TATA	8	7	7	8
Toyota	9	9	7	8
Honda	7	6	8	6
Maruti Suzuki	5	7	7	9

Use AHP-TOPSIS for the selection of best car manufacturer for Vice Chancellor of BITS Pilani.
 (Assume RI value = 0.9 for N = 4)

[6]

Q4 (a) Following Table shows the relationships among 12 factors to world class manufacturing.

S. No.	Factors	12	11	10	9	8	7	6	5	4	3	2
1	CST	O	V	A	A	A	A	A	A	A	X	A
2	ET	V	V	V	V	X	A	V	V	V	V	
3	Qly	A	V	A	A	A	A	A	A	A		
4	SMM	O	V	A	A	O	A	A	X			
5	PPC	X	V	A	A	A	A	A				
6	EE	V	V	V	A	O	O					
7	TMC	V	V	V	V	V						
8	GPP	V	V	V	X							
9	KM	O	V	V								
10	CEPR	V	V									
11	CRCG	A										
12	EHS											

Apply Interpretive Structural Modelling (ISM) technique to establish hierarchy and inter-relationship among these factors by developing: (i) Initial reachability matrix (ii) Final reachability matrix (iii) Level partitions (iv) ISM Model (v) MICMAC analysis

[5]

(b) Do you think, Industry 4.0 practices will have a negative impact on environmental sustainability? Justify your answer.

[5]