SCHEME OF VALUATION

(Scoring Indicators)

Revision : 2015 **Course Code:5022**

Course Title:INDUSTRIAL ENGINEERING

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
I1.	Defined as the Engineering approach to the detailed analysis of the use and cost of the resources of an organization	2	2	
2.	Production:Process to transform a set of inputs into a specified set of outputs like finished products and services in proper quantity and quality	1		
	Productivity = Output /Input Productivity is the relationship between the outputs generated from a system and the inputs that are used to create those outputs.	1	2	
3	H - HOLD, TL - TRANSPORT LOADED P - POSITION A - ASSEMBLE	($\frac{1}{2}$x 4 =2)	2	
4	To improve quality in all aspects To increase production and profit To ensure customer satisfaction To determine the causes of variations in the characteristics of products and services	($\frac{1}{2}$x 4 =2)	2	
5	Inspection procedure evaluating a portion of the product or a specific quantity of a material in a lot,for the purpose of accepting or rejecting the lot as either confirming or not confirming to a quality specification	2	2	5x2=10
	PART B			
II 1	Increases the productivity Prompt delivery of products to customers is possible It increases the wage structure which leads to employee motivation It brings more satisfaction to workers It Creates stable employment and improved working conditions It ensures proper returns to investors and security	1x6 =6 (Any six points)	6	

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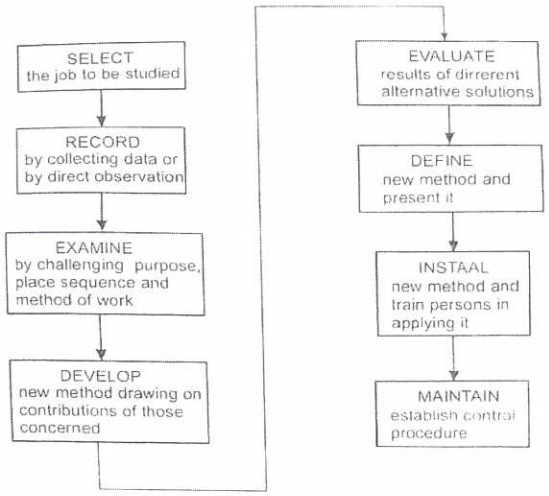
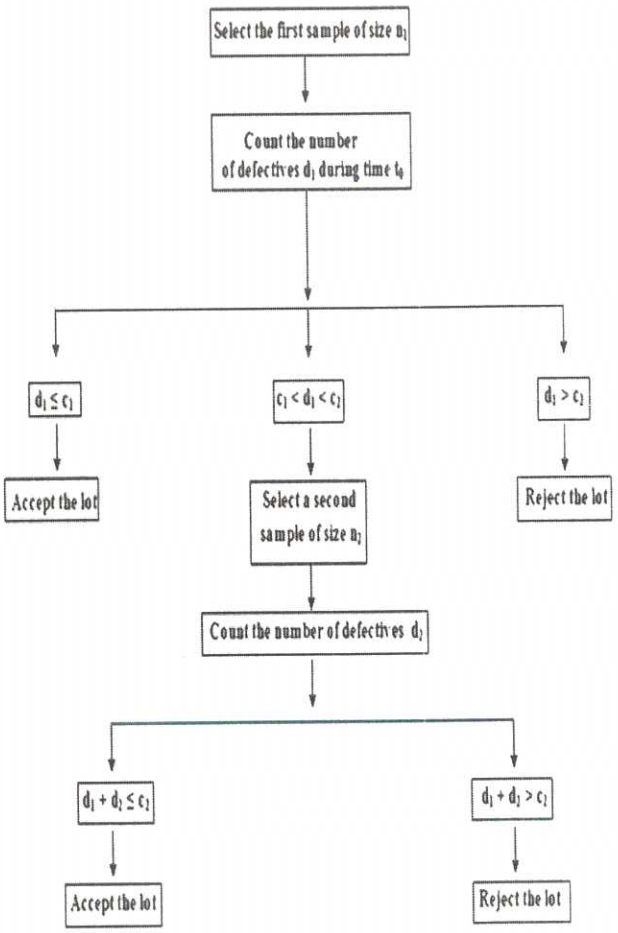
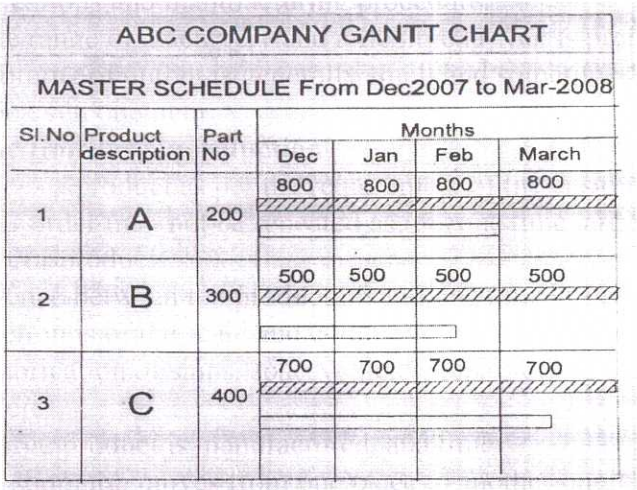
2	(a) The **breakdown maintenance** is a type of maintenance that involves using a machine until it completely breaks down and then repairing it to working order. Applied to those machines which are not important and which will not affect production.	2		
	(b) **Scheduled maintenance** is a type of maintenance which is conducted according to a predetermined and pre planned schedule. This is normally performed according to the recommendations of the supplier of the equipment.	2		
	(c) Preventive maintenance is a kind of maintenance which is done before the machine failure .The symptoms of failure will be identified from the equipment and the maintenance will be carried out.	2	6	
3		6	6	
4	Normal time = m/c time +(manual time x Rating) $= 7 + (5x\frac{110}{100}) = 12.5$ min Standard time = Normal time + Allowance = 12.5 + (10% of 12.5) = 13.75 min	3 3	6	
5	Variable(X) X-$\bar{X}$ $(X-\bar{X})^2$ 9 -6 36 14 -1 1 22 7 49 15 0 0 20 5 25 17 2 4 11 -4 16 12 -3 9	3		

No.	Scoring Indicator	Split up Score	Sub Total	Total
	$\Sigma x = 120, \bar{X} = \frac{120}{8} = 15 \ \Sigma(X-\bar{X})^2 = 140$ Standard deviation $(\sigma) = \sqrt{\frac{\Sigma(X-\bar{X})^2}{N}}$ $= \sqrt{\frac{140}{8}} = 4.18$	3	6	
6	1. It helps to assess the existing quality 2. It takes appropriate action to eliminate un acceptable quality 3. It tries to reduce the wastage and rework, delay of operation 4. It helps to meet the challenges due to strict competition 5. It regularly evaluate the effectiveness of the quality programmes 6. It promotes the techniques like quality circle, zero defect programmes etc.	Any 6 points 6 marks	6	
7	 C1 =Acceptance number for first sample C2 = Acceptance number for second sample	6	6	(5x6=30)

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
	PART C UNIT -I			
III(a)	**(1) Job order production** Production is made on the basis of customer's orders. Items are made in accordance with the specifications and requirements of the customers. Each job order may be different in nature regarding its specifications and manufacturing procedure. A wide range of machinery and a flexible lay out is preferred. The volume of output is generally small and sometimes it may be even one item.	4		
	(2)**One time large production** Produces a product as per the requirement of the customers. Similar order may not be repeated as it is one time large project or product Difference between job production and one time large production is of the scale and complexity of the product Eg: fabrication of ships, spacevehicles, repair of big air crafts etc. One large product is manufactured at a time In job shop, job moves from one place to another but in one time large projects major components remain at a place.	4	8	
(b)		4		
	The sales forecast gives the production quantities of various products for a year. The main aim of master schedule is to plan the production of the products to meet the demand in the market. The chart shows the scheduled production and the actual output of the products at the end of February. Output of A is same as the planned output, Whereas B is less than the planned output due to some reasons. Remedial action should be taken to meet the production requirement. The actual output of C is more than the planned output.	3	7	

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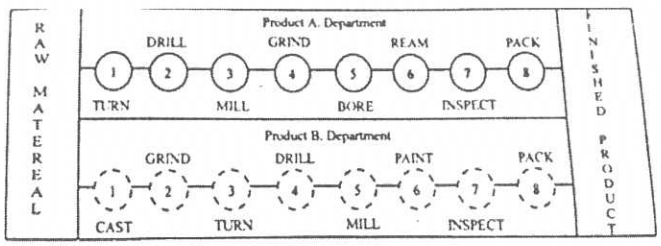
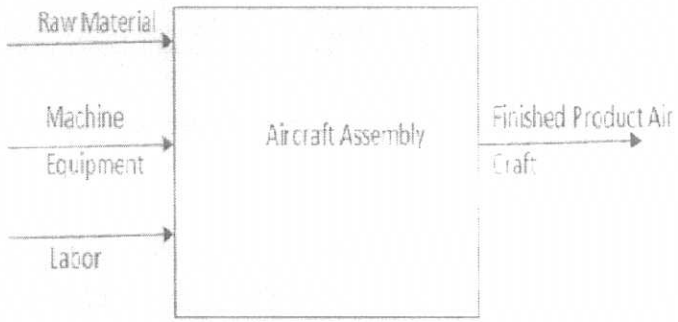
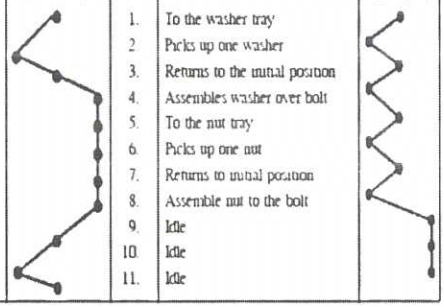
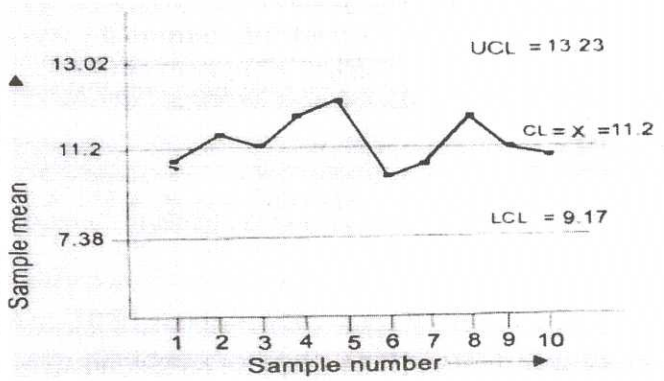
IV(a)	Factors to be considered **1. Availability of Raw materials and supplies:** The facility in general should be near to the vendors or suppliers. This will further reduce the transportation cost of incoming materials and the lead-time of the inventory replenishment. **2.Proximity to markets** Cost of transportation of finished goods, costof distribution etc. can be reduced if the market is near **3. Transportation and communication facilities** Generally the industries have a tendency to locate the industrial units near railway station, high ways or ports. Communication facilities like mail,telephone,internet etc. are adequate **4. Availability of power and fuel** Coal, electricity,oil,natural gas etc. are important sources of power. Their availability is important. **5. Availability of labour** Right kind of work force in required numbers at reasonable rate is also a deciding factor in site selection. **7.Availability of water** Water should be available in good quality and quantity **8. Site size:** The plot of land must be large enough to hold the requirements of the proposed facility. Sometimes a good site may not have the required area.	8 marks For any 8 points	8	
IV(b)	**(1) Product lay out or line lay out**  Processing equipments and machines are arranged according to the sequence of operations required for a product. Only One type of products can be manufactured.The product will be standardised and will be produced in large quantities. Raw material will be fed from one end and after the processes the finished products will be delivered at the other end. Used for high volume production	2 2	4	

Qn.No	Scoring Indicator	Split up Score	Sub Total	Total
	(2) Fixed Position layout			
		$1\frac{1}{2}$		
	The major component or body (too heavy or too big) of the product remains in a fixed position. Raw materials, Machine equipments ,labour etc. will be brought to that location	$1\frac{1}{2}$		
	Eg: Used to manufacture aircraft,ship,boiler,hydraulic & Steam turbines etc.		3	
V(a)	UNIT –II			
	Two handed process chart			
	Job : Assembly of washer and nut to a bolt Chart begins : Both hands free before assembly — Assembly Bolt Washer Nut Chart ends : Both hands free after assembly Chart : Existing method/Proposed method — Date : Operator Operator : — Chart No : Left hand — Right hand Sl. No. / Description of the activities / Symbols — Sl. No / Description of the activities / Symbols 1. To the bolt tray — 1. To the washer tray 2. Picks up one bolt — 2. Picks up one washer 3. Returns to original position — 3. Returns to the initial position 4. Holding the bolt — 4. Assembles washer over bolt 5. Idle — 5. To the nut tray 6. Idle — 6. Picks up one nut 7. Idle — 7. Returns to initial position 8. Idle — 8. Assemble nut to the bolt 9. To the assembly tray — 9. Idle 10. Puts the bolt in the tray — 10. Idle 11. Returns to the original position — 11. Idle 	5		
	Activities of the worker's hands are recorded in relation to the other. Helps to analyse what left hand is doing when right hand is at work or vice versa. Storage symbol is used when the hand is used as a grip.Gives a synchronised and graphical representation of the sequence of manual activities of the worker.	3	8	

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
V(b)	1. Define the problem i.e identify activity or activities of interest to know the percentage of time it is working or idle. 2. Obtain the approval and consent of the concerned supervisor or manager. 3. Make a preliminary estimate of the percentage occurrence of the activity to be measured. 4. State the desired accuracy and level of confidence. 5. Calculate the required number of observation for the desired study 6. Re compute the required sample size after two or three intervals by using the data collected so far 7. Summarise the result at the end of the day and adjust the number of observations as deemed appropriate. 8. Check the accuracy of the data at the end of study	7	7	
VI(a)	**SIMO CHART** Operation ..... Date ..... Name of worker ..... Film No. ..... Component, Name ..... Operation No. ..... Method : present / proposed **Left hand description** | **Symbol** | **Time (Winks)** | **Symbol** | **Right hand desctiption** To bolt | TL | 20 | TL | To nut Grasp bolt | G | 5 | G | Grasp Nut To job | TL | 10 | TL | To job Hold | H | 50 | A | Assemble to bolt A simo chart is a chart, often based on film analysis. used to record simultaneously on a common time scale the therbligs or Micromotions performed by different parts of the body of an operator.The movements are recorded by a 16mm movie camera. The time scale is marked in"winks" (1 wink = 1/2000 minute).The movements are recorded with the help of the "wink counter" placed in such a position that it can be seen rotating during the filming.	5 3	8	

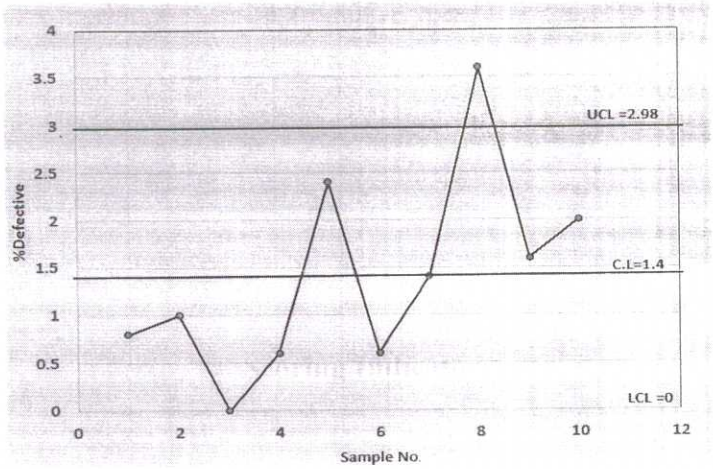
Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
VI (b)	Steps to develop standard data 1. **Decide on coverage**: Decide the number of jobs for which the standard data are derived. 2. **Break the job into elements**:Identify as many elements as possible that are common to various jobs. 3. **Decide on the type of reading**: Decide whether to use readings based on stop watch time study or derived from PTS systems such as MTM. 4. **Determine the factors:** determine the factors the time on each element and classify them into major and minor factors. The minor factors will exert small influences in readings whereas the effect of major factors will be considerable. 5. **Measure the time:** When using macroscopic systems, measure the time taken to perform the activity from actual observations. 6. **Compile and test:** Compile and test the data for correctness and accuracy	7	7	
VII (a)	ΣX= (11+11.3+11.2+11.6+11.8+10.6+10.8+11.4+ 11.2+11.1) = 112			
	$\bar{X} = \frac{112}{10} = 11.2$	1		
	$\bar{R} = \frac{(3+5+2+4+3+3+4+5+4+2)}{10} = \frac{35}{10} = 3.5$	1		
	Control limits			
	UCL = $\bar{X}$ + $A_2\bar{R}$ = 11.2 + 0.58 x 3.5 = 13.23	1		
	LCL = $\bar{X}$ - $A_2\bar{R}$ = 11.2 - 0.58 x 3.5 = 9.17	1		
		3		
	The process is in control	1	8	

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
VII (b)	Manufacturing Processes are subjected to variability Products manufactured will not be alike. There will be slight variations in their characteristics such as length, diameter, size, strength, surface finish etc.These variations are tolerated/Accepted if they are within the limits.If the variations are within the limits that process is said to be stable else unstable or out of control.	3		
	Types **1.Variations due to chance factors** Occurs in a random way Inherent with the system and are unavoidable There are no specific reasons for these variations. In Quality control these are not considered since variations of measurements are usually small	2		
	2. Variations due to Assignable causes Occurs due to poor quality of raw materials, poor machine conditions, mistakes of operators, differencein skill levels of operators etc. Greater in magnitude as compared to chance causes and can be eliminated	2	7	
VIII(a)	Total defectives = 4+5+0+3+12+3+7+18+8+10 = 70			
	Mean fraction defective $(p) = \frac{70}{5000} = .014$ C.L. =100p = 100x.014 = **1.4**	1		
	$UCL = 1.4 + 3x100\sqrt{\frac{p(1-p)}{500}}$ $= 1.4+3x100\sqrt{\frac{.014(1-.014)}{500}} =$ **2.98**	1		
	$LCL = 1.4 - 3x100\sqrt{\frac{p(1-p)}{500}}$ $=1.4 - 3x100\sqrt{\frac{.014(1-.014)}{500}} =$ **-0.17** Taken as zero	1		

Sample	1	2	3	4	5	6	7	8	9	10
No.of Defectives	4	5	0	3	12	3	7	18	8	10
%def. 100p	0.8	1	0	0.6	2.4	0.6	1.4	3.6	1.6	2

1

Qn.No.	99 Scoring Indicator	Split up Score	Sub Total	Total



3

% defectives exceeds the UCL for the Eighth sample.
So the process is out of control

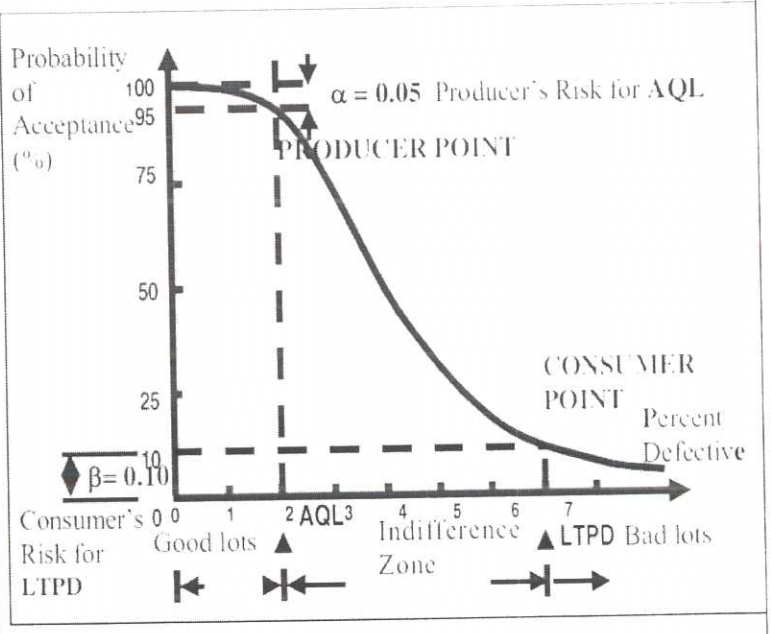
8

(b)

Floor inspection	Centralised inspection
Inspection is done in shop or Floor	Inspection is done in centralised
Suitable for both heavy and light work pieces	suitable for light work pieces
Quicker as no transportation	Transportation is more
Corrective action can taken immediately	takes time to corrective action
No damages due to less handling	More chances of damages as handling is more.
Chance of mixing defectives is less	Chance of mixing defectives is more.
Inspection may be biased	No biase in inspection
Piling up of work near the machine	No piling of work near the machine.
Precision &costly equipments Cannot be brought to the shop	All equipments are in the room.
Maitenance of inspection Records is difficult.	record keeping is easy.

7

7

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
IX (a)	Factory cost = Prime cost + Overheads = (250+400+100) + (300) = Rs.**1050**	1		
	Production cost = Factory cost + Office expenses = 1050+0 = Rs.**1050**	1		
	Total cost = Production cost + Selling overheads = 1050 + 45% of 1050 = **1522.5**	2		
	Selling price = Total cost + Profit Let S be the selling price S = 1522.5+0.1S ; S = RS.**1691.6**		8	
	Unit selling price = $\frac{1691.6}{50}$ = **Rs.33.83**	4		
(b)		5	7	
X(a)	Explanation	2		
	C = 20000/- S = 4000/- N= 4 years Sum of digits of years = 1+2+3+4 =10			
	Depreciation charges for first year = $\frac{4\,(20000-4000)}{10}$ = **6400**	2		
	Depreciation charges for second year = $\frac{3\,(20000-4000)}{10}$ = **4800**	2		
	Depreciation charges for third year = $\frac{2\,(20000-4000)}{10}$ = **3200**	2		
	Depreciation charges for fourth year = $\frac{1\,(20000-4000)}{10}$ = **1600**	2	8	

Qn.No.	Scoring Indicator	Split up Score	Sub Total	Total
(b)	1.To decide to make or to buy 2.To determine material and labour cost 3.To determine the cost of material to be purchased 4.To determine various overheads 5.To determine the selling price 6.To help in budget preparation 7.To determine most economical process of manufacture	7(any seven points)	7	