Paper 9 – OPERATIONS MANAGEMENT & STRATEGIC MANAGEMENT

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Full Marks: 100   **Time allowed: 3 hours**

The figures in the margin on the right side indicate full marks.
This question paper has two sections.
Both the sections are to be answered subject to instructions given against each.

Section – A

I. **Answer the following questions which is compulsory:**

1. **Answer any five of the following questions:**   **[5×2=10]**
    (a) Define Load Chart.
    (b) Define Product Mix.
    (c) Define method of Job Evaluation.
    (d) Limitations of Preventive maintenance.
    (e) What do you mean by DSS?
    (f) Name any two models of DBMS.
    (g) Define Primary Key.
    (h) What kaizen mean?

Answer:

1. (a) A load schedule or load chart is a procedure for comparing the actual load (labour hours and machine hours) required to produce the products as per the MRS against the available capacity (labour hours and machine hours) in each week.

    (b) Production of number of products affects the demonstrated capacity of the process as each product needs setup time. Setup for a new product might require setting of machines, change in process parameters, and cleaning the facility to change over form the product to another product. A diverse product mix requires many such changes, which reduces the demonstrated capacity.

    (c) Job evaluation is a systematic and objective process used by organization to compare the jobs within the organization to determine the relative value or worth or each job.
    Criteria used in job evaluation can include factors such as education skills, job responsibilities etc.

    (d) Limitations of Preventive maintenance:
        (i) More expensive in the short term and during the initial stages of introduction of preventive maintenance programme.
        (ii) Inspection of plant, equipment and machinery will have to be carefully planned and implemented and improved over a period of time.

    (e) Decision support system is an IT tool based on models for interpretation and analysis of data and presenting the same for facilitating decision making.

    (f) Different models of DBMS:
        (i)   Hierarchical database
        (ii) Network database
        (iii) Relational database

(g) Primary key is a set of one or more fields / columns of a table that uniquely identify a record in database table. It cannot accept null, duplicate values. Only one candidate key can be primary key.

(h) KAI means change and ZEN means better. Thus KAIZEN means change for the better implies continuous improvement done consistently.

2. **Match the following:**   [5×1=5]

	List A			List B
A.	Knowledge Base	1)	Stock Level	
B.	Inventory Control	2)	Syntax Error	
C.	JAVA	3)	Expert System	
D.	Debugging	4)	Authentication of Electronic Record	
E.	Digital Signature	5)	Programming Language	

Answer:

	List A		List B
A.	Knowledge Base	3	Expert System
B.	Inventory Control	1	Stock Level
C.	JAVA	5	Programming Language
D.	Debugging	2	Syntax Error
E.	Digital Signature	4	Authentication of Electronic Record

3. **Statement whether the following statements are True/False:**
   1. MRP is a marketing technique.
   2. Online processing and real time processing are same.
   3. Database Approach increasing redundancy.
   4. Method study should precede Work Measurement.
   5. Project cost increase, as the duration of the project increases.

Answer:

3. (a) False
   (b) False
   (c) False
   (d) True
   (e) True

4. **Fill in the blanks with one word or two:**
   (a) Egronomics is another name for _____.
   (b) In linear programming, the word linear establishes certain relationship among _____.
   (c) An executive information system is an advanced model of _____.
   (d) _____ indicates a sequence of instruction that repeat until a predetermined count or other test is satisfied.
   (e) A _____ is called on attribute.

Answer:

4. (a) human engineering;
   (b) variables;
   (c) decision support system;
   (d) Loop;
   (e) header.

SECTION – B

II. **Answer any three questions from the following:**

1. **(a) Sonar Gold Fields miners at 10th level have an accepted production standard of two trolley-loads an hour in an eight-hour working day. In addition to the mining of the gold-bearing soil, the miners have to do a few routine jobs such as cleaning, sharpening and maintaining the tools, for which they are paid a wage of Rs. 9 per hour upto a maximum of two hours per day. The base wage rate of the miners engaged in production/mining job is Rs.6.60 per hour. If Subrato, a miner, produced 18 trolley-loads in addition to performing his routine tasks, what wages should he get at the end of the day?**

   (b) The annual sales of TV sets by a dealer in Delhi are as under:

Year	2012	2013	2014	2015	2016
Sales (thousand units)	3	14	36	4	33

   Fit a linear trend equation to the sales figure and estimate the sales for the year 2017.

Answer:

1. (a) Subrato worked for 18 / 2 = 9 standard hours on the incentive job.
   This is equivalent to a productivity rate of : 9 std. hrs 6 hrs. worked = 150%

   The 'incentive wages' earned by Subrato are: 150/100 x (Rs.6.60) x (6 hours) = Rs.59.40

   The 'non-incentive' wages earned by Subrato are: (Rs.9.00) x (2 hours) = Rs.18.00

   The total wages to be paid to him are Rs.59.40 + Rs.18.00 = Rs.77.40.

   (b)

Year	Time deviation from 2014	Sales ('000 units)	Square of Time deviation	Product of Time deviation & Sales
2012	-2	3	4	-6
2013	-1	14	1	-14
2014	0	36	0	0
2015	+1	4	1	4
2016	+2	33	4	66
N = 5	$\Sigma X = 0$	$\Sigma Y = 90$	$\Sigma X2 = 10$	$\Sigma XY = +50$

   Regression equation of Y on X
   Y= A + bX
   a = ΣY / n = 90 = 18
   b = ΣXY / $\Sigma X2$ = 50 / 10 = 5
   Y = 18 + 5X
   Y 2017 = 18 + 5 (3) = 18 + 15 33 i.e. 33000 units of Tvs.

2. **(a) A project consists of six activities. Activities P, Q, R run simultaneously. The relationships among the various activities is as follows:**

Activity	Immediate successor
P	S
Q	T
R	U

   Activity T is the last operation of the project and it is also immediate successor to R and S. Draw the network of the project.

(b) **Six salesmen are to be allocated to six sales regions so that the cost of allocation of the job will be minimum. Each salesman is capable of doing the job at different cost in each region the cost matrix is given below:**

		Region					
		I	II	III	IV	V	VI
Salesmen	A	15	35	0	25	10	45
	B	40	5	45	20	15	20
	C	25	60	10	65	25	10
	D	30	70	40	5	40	50
	F	10	25	30	40	50	15

(i) **Find the allocation to give minimum cost what is the cost?**

(ii) **Now suppose the above table gives earning of each salesman at each region. How can you find an allocation so that the earning will be maximum? Determine the solution with optimum earning.**

Answer:

2. (a)

Activity immediate successor   P   S
Q   T
R   U
S   V

T
U   v
V   -
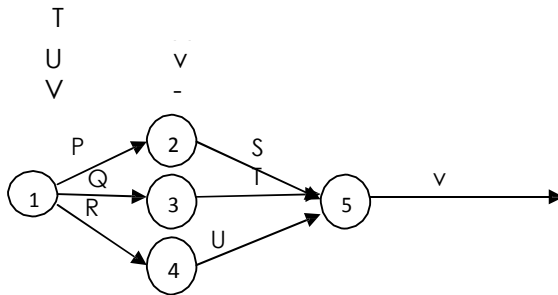
(b) **Step - I Row matrix**; Select least value of the each row and then subtract the same form the remaining values in each row

	I	II	III	IV	V	VI
A	15	35	0	25	10	45
B	35	0	40	15	10	15
C	15	50	0	55	15	0
D	15	10	25	0	15	50
E	25	65	35	0	35	45
F	0	15	20	30	40	5

Step- II: Column operation select least value in each and submit the same form values in each column

	I	II	III	IV	V	VI
A	15	35	0	25	0	45
B	35	0	40	15	0	15
C	15	50	0	55	15	0
D	15	10	25	0	5	50
E	25	65	35	0	25	45
F	0	15	20	30	40	5

Step-III: Improvel matrix: first least value in uncovered lines and subtract the same from uncovered lines value. Add to the value at intersect point and unchanged the voverd lines values.

3. **(a)** Calculate the number of the units expected to fail in a year and the mean time between failure from the following:

Testing time	= 100 hours
Samples tested	= 50 units
Failures	= 2 units
Average usage	= 2 hours/day
Total sales in the year	= 500 units

(b) The data on the operating costs per year and resale prices of equipment A whose purchase price is Rs.10,000 are given here:

Year	1	2	3	4	5	6	7
Operating Cost (Rs.)	1500	1900	2300	2900	3600	4500	5500
Resale Value (Rs.)	5000	2500	1250	600	400	400	400

(i) What is the optimum period for replacement?

(ii) When equipment A is 2 years old, equipment B, which is a new model for the same usage, is available. The optimum period for replacement is 4 years with an average cost of Rs. 3600. should we change equipment A with that of B? If so, when?

Answer:

3. (a) Total test time = 50 x 100 hours = 5,000 unit-hours
    There are 2 units which have failed and hence the total time is to be adjusted for the number of hours lost due to failures during testing.

    Lost hours = 2 x 100 / 2 = 100 (the assumption is made here that each of the failed unit has lasted an average of half of the test period).

    Therefore, the test shows that there are two failures during (5,000 – 100) = 4900 unit-hours of testing.

    During 365 days a year and 2 hours a day for 500 units, the number of expected failures = (2/4900) x 500 x 365 x 2 = 149 units approx

    Mean time between failures = (4900 unit-hour of testing / 2 failures) / (2 x 365) = 2450/730 = 3.36 unit-year per failure.

    (b) (i) The determination of the optimal period of replacement of equipment A is given Table below.

    Table: Determination of Optimal Replacement Period

Year	M_t	Cum M_t	C-S	T(n)	A(n)
1	1500	1500	5000	6500	6500,0
2	1900	3400	7500	10900	5450.0
3	2300	5700	8750	14450	4816.7
4	2900	8600	9400	18000	4500.0
5	3600	12200	9600	21800	4360.0*
6	4500	16700	9600	26300	4383.3
7	5500	22200	9600	31800	4542.9

    Since the average cost corresponding to the 5-yearly period is the least, the optimal period for replacement = 5 years.

    (ii) As the minimum average cost for equipment B is smaller than that for equipment A, it is prudent to change the equipment. To decide the time of change, we would determine the cost of keeping the equipment in its 3rd, 4th and 5th year of life

and compare each of these values with Rs.3600 (the average cost for equipment B). The equipment A shall be held as long as the marginal cost of holding it would be smaller than the minimum average cost for equipment B. the calculations are given here:

Year	Operating Cost	Depreciation	Total Cost
3	2300	1250 (= 2500 – 1250)	3550
4	2900	650 (=1250-600)	3550
5	3600	200 (=600-400)	3800

Since the cost incurred in keeping the equipment A in the third and the fourth years is less than the average cost for equipment B, the replacement should be done after 2 years.

4. **(a) List the benefits of Benchmarking?**
   (b) List the various steps in maintenance planning.

Answer:

4. (a) Benefits of Benchmarking
   (i) Benchmarking is particularly helpful in validating proposals for change.
   (ii) Benchmarking often results in creative imitation and the adoption of new practices that overcome previous industry barriers.
   (iii) This search for diversity and for innovative breakthroughs applied elsewhere is at the core of benchmarking benefits.
   (iv) By sharing information, all parties benefit, because it is difficult to excel in all activates.
   (v) Sharing information and data is often the first hurdle to be overcome in the Benchmarking process.
   (vi) Do not, however, attempt benchmarking in areas in which trade secrets or sensitive information determines the outcome of the process.
   (vii) Benchmarking, used in conjunction with other quality techniques or used alone, can influence how an organization operates.
   (viii) If the search for "Best", or just "Better" practices is performed correctly, then the likelihood of successful outcome is quite high.
   (ix) Success however, assumes that pitfalls are avoided and prerequisites have been met before Benchmarking is initiated.

   (b) Steps in Maintenance planning:
   (i) To know the equipment to be maintained, available technique for maintenance and the facilities available to carry out maintenance work.
   (ii) To establish the priorities of maintenance activities by categorising the activities as emergency work, priority work and non-priority work.
   (iii) To investigate the maintenance work to be done at the workstation to ascertain physical access and space limitations, facilities for lifting and handling (moving), facilities for disposal of water, oil, gas and other hazardous materials, space for keeping the dismantled parts etc.
   (iv) To develop the repair plan on the basis of
       (a) Recommendation of original equipment manufacturer;
       (b) Technical experience;
       (c) Equipment history and
       (d) Management decision for a new technique of maintenance work.
   (v) To prepare a list of maintenance materials and spare parts required.
   (vi) To prepare a list of special tools and special facilities such as material handling equipments (such as crane) required.
   (vii) To estimate the time required to do the maintenance work.
   (viii) To provide for necessary safety devices and safety instructions.

Section – C

I. **Answer any two question form the following:**

1. **(a) State the main reasons for the spread of E-commerce.**
   (b) What are major features of ERP?

Solution:

1. (a) Main Reasons for the Spread of E-commerce
   (i) Digital convergence, i.e., it means that due to digital revolution almost all digital devices can communicate with one another.
   (ii) Today's E-commerce is available to anyone, anywhere in the world, anytime 24 × 7 (24 hours a day, 7 days a week).
   (iii) It helps in bringing about positive changes in an organization.
   (iv) People are now having a widespread access to IT and Personal Computers (PCs).
   (v) E-commerce helps in reducing operating costs and increasing profit margins due to global operations.
   (vi) Demand for customized products and services are increasing.

   (b) Major features of ERP:
   (i) ERP provides multi-platform, multi-mode, manufacturing, multi-currency, multi-lingual facilities.
   (ii) It supports strategic and business planning activities, operational planning and executions activities, creation of materials and resources. All these functions are effectively integrated for flow and update of information immediately upon entry of any information.
   (iii) Has end to end supply chain management to optimize the overall demand and supply data.
   (iv) ERP facilitates company-wide integrated information system covering all functional areas like manufacturing, selling and distribution, payables, receivables, inventory accounts, human resources, purchases etc.
   (v) ERP performs core activities and increases customers service, thereby augmenting the corporate image.
   (vi) ERP bridges the information gap across organizations.
   (vii) ERP provides complete integration of systems not only across departments but also across companies under the same management.
   (viii) ERP is the solution for better project management. ERP allows automatic introduction of the latest technologies like electronic fund transfer, electronic data interchange, Internet, Intranet, Video conferencing, E-commerce etc.
   (ix) ERP eliminates most business problems like materials shortages, productivity enhancements, customer service cash management, inventory problems, quality problems, prompt delivery etc.
   (x) ERP provides intelligent business tools like decision support systems, executive information system, data mining and easy working systems to enable better decisions.

2. **(a) Explain characteristics of an information system**
   (b) What are the basic features of an MIS?

Solution:

2. (a) The general characteristics of an information system are:

   1. **Specific Objective:**
      • The information system should have some specific objective.
      • An information system, in highly scientific research centre, will have an

objective to accumulate data from different activities, display of some information instantly for controlling activities and so on.
- A system without object is useless.

2. **Structured:**
   - The structure of the information system refers to diagrammatic representing of the system showing sub-systems, their inter-relation and the procedure to be followed to fulfill the process requirements.
   - An information system should have a definite structure with all modules of sub-systems.
   - The structure depends on the sub-models, their interactions and integration requirements, operational procedure to be followed and the solution sets.

3. **Components:**
   - The sub-systems are the components.
   - The sub-systems should be distinguishable among themselves but have well-defined relation among them.
   - For example, a sales system may be sub-systems like invoicing, delivery monitoring, and sales proceeds collection system.

4. **Integrated:**
   - An information system should be designed in such a fashion that proper integration among sub-systems are taken care to establish correct linkage and generate meaningful information.
   - Information in isolation may not be that meaningful but its usage is improved if it is integrated with information of other closely related issues.
   - For example, sales information of a region becomes more meaningful if other information combined in the information set.

5. **Life-Cycle:**
   - An information system will have its own life-cycle.
   - The duration of life cycle varies from system to system
   - Every information system will have distinctly different phases — Initial, Growth, Maturity and Decline.

6. **Behavior:**
   - A system has its own set of reactions and the outcome depends on its environment.
   - A well managed business information system behaves nicely with its users by satisfying them with correct and timely information.
   - The design of the system plays a good role in setting its behavior pattern.

7. **Self- Regulatory:**
   - An information system which may have different sub-systems interacting with the each other in a desired fashion to be operative smoothly and in the process they regulate themselves. This is what self-regularly nature of the system.

(b) Basic features of MIS
   (i) **Management oriented** - It means the effort for development of the information system should start from an appraisal of management needs and overall business objectives.
   (ii) **Integrated** - Development of Information should be an integrated one. It means all the functional and operational information sub-system should be tied together into one entity.
   (iii) **Reliability** – MIS system should provide most reliable information. A thorough check of input information, process follow and output reports on regular and routine

basis.
  (iv) **Flexibility** – MIS should be flexible enough to take care of changes in the environment in the business system.
  (v) **Consistency** – The input data and output reports must follow some standard norms so that consistency is preserved.
  (vi) **Timeliness** – One of the most important issues involved in the effectiveness of MIS are flow of information t right time to the user level of management.
  (vii) **Relevance** – Only relevant information should flow at different levels of management to increase the effectiveness of MIS.
  (viii)**Simplicity** – An MIS system should be as simple as possible so that people at operation and users do not feel any hazards. The success of a system lies in the acceptance by operation staff and users.

3. **(a) Explain about EDI.**
   (b) State two distinctive features of each of the following technologies used in a business Situation:
   (i) Management Information System
   (ii) Decision Support System
   (iii) Executive Information System
   (iv) Expert Systems.

Answer:

3. (a) EDI is the system where data is transferred electronically in machine readable or processable form. Here, any message is sent through EDI would be immediately processed by receiving computer without any human intervention or rekeying.

   Before EDI following steps were involved in commerce:

   Step I: Creation of purchase order (PO) by the customer.
   Step II: PO is sent by the customer (sender of the message) using post office fax, telex and so on.
   Step III: PO is received by the supplier (receiver of the message)
   Step IV: PO is interpreted by the supplier (received)

   After Edi following steps were involved in commerce:

   Step I: Customers computer system creates and sends the electronic PO.
   Step II: Po is received by the supplier (receiver of the message) and places the order directly into his system and he acts accordingly.

   Uses of EDI:

   EDI is used in following ways:
   I. EDI is used to electronically transfer documents such as purchase order, invoices, shipping notices, receiving advises and other standard business correspondence between the trading partners.
   II. EDI can also be used to transmit financial information and payment in electronic form. However, where EDI is used for effecting payment it is commonly known as financial EDI or electronic funds transfer.

   (b) Two distinctive features of each of the following terms are mentioned below:
   (i) Management Information System:
       (A) It meets information requirement at different levels with pre-defined reports.
       (B) It supports routine decision making.
   (ii) Decision Support System:
       (A) It is based on one or more corporate databases.

(B) It is used for solution in a complex business situation.

(iii) Executive Information System:

(A) It aims at providing information to top executives of an organization who are involved in strategic decision making.

(B) It is an advanced model of Decision Support System which can take care of unstructured problem situation.

(iv) Expert System:

(A) It is a knowledge based system which acts as an expert in devising solutions.

(B) It operates on previous experience which is stored in a database.