INTERMEDIATE EXAMINATION

GROUP II

(SYLLABUS 2008)

SUGGESTED ANSWERS TO QUESTIONS

DECEMBER 2013

Paper- 9: OPERATION MANAGEMENT AND INFORMATION SYSTEMS

Time Allowed : 3 Hours **Full Marks : 100**

The figures in the margin on the right side indicate full marks.

Section I: Operation Management

Answer Question No. 1 which is compulsory and any two questions from the rest, under Section I.

1. (a) Match the terms in Column I with the relevant terms in Column II: 0.5x8

Column I	Column II
(A) Fork-lift-Truck	(i) Milling Machine
(B) Teeth on a gear wheel	(ii) Move heavy loads over rectangular area
(C) Electrical Overhead Travelling	(iii) Go-No Go gauge
(D) Methods Time measurement	(iv) Drilling Machine
(E) Industrial Finance Corporation of India	(v) Handling crates on pallets within a factory
(F) ABC	(vi) Project funding
(G) Hole in a block	(vii) Work measurement
(H) Inspection	(viii) Classification based on annual usage value

(b) For each part below, choose the most appropriate answer out of the four options given against each part: 1x5

(i) One of the important charts used in Programme control is:
(A) Material chart, (B) Gantt chart, (C) Route chart, (D) Inspection chart.

(ii) Generally the size of the order for production in Job production is:
(A) Small, (B) Large, (C) Medium, (D) Very large.

(iii) An electro-chemical process which gives a slight anticorrosion protection and improves the appearance of the product is:
(A) Lapping, (B) Anodizing, (C) Enamelling, (D) Honing.

(iv) Devices that transfer electrical energy from one circuit to another through inductively coupled wires are:
(A) Transformers, (B) Current, (C) Motors, (D) Electrical Drivers.

(v) The process of reheating which will reduce the brittleness and soften the steel is known as:

(A) Normalising, (B) Quenching, (C) Case Hardening, (D) Tempering.

(c) Examine each statement and indicate whether it is 'True' or 'False': 1x5

(i) Process improvement is not necessary when the process is slow in responding to the customer.

(ii) In 'Level Capacity' plan, the production capacity is matched with the demand in each period.

(iii) Vertical lines of authority and responsibility must be kept as short as possible.

(iv) Technology does not affect the scale of production operations.

(v) 'Routing' and 'Scheduling' are not interconnected and both can be carried out separately and independently.

Answer:

1. (a) (A) - (v); (B) - (i); (C) - (ii); (D) - (vii); (E) - (vi); (F) - (viii); (G)-(iv);(H)-(iii).

(b) (i) (B) Gantt Chart,
(ii) (A) Small,
(iii) (B) Anodizing,
(iv) (A) Transformers,
(v) (D) Tempering,

(c)

(i) False. Process improvement is necessary when the process is slow in responding to the customer.

(ii) False. In 'matching capacity with demand plan', the production capacity is matched with the demand in each period.

(iii) True.

(iv) False.

(v) False. 'Routing' and 'Scheduling' are interconnected and are independent and either of these activities cannot be undertaken independently.

2. (a) A workshop has 20 Nos. of identical machines. The failure pattern of the machine is given below:

Elapsed time after maintenance attention (in months)	Probability of failure
1	0.20
2	0.05
3	0.20
4	0.20
5	0.15
6	0.20

It costs ₹ 200 to attend a failed machine and rectify the same. Compute the yearly cost of servicing the broken down machines.

(b) An operator manufactures 12 identical components in a week of 48 hours duration. Each component takes 320 standard minutes and the material cost per component is ₹ 20. 4

Estimate the cost per component if the company operates an incentive system as below: Guaranteed basic rate is ₹ 5 per hour upto 80% performance level, 110% of the basic rate is paid if the performance level is between 80% and 100% and 120% of the rate is paid if the performance level falls between 101% and 110%. Above 110% performance level,

130% of the basic wages are paid. Overhead component of each job is 150% of the direct labour.

(c) A Company adopts a counter-seasonal product strategy to smooth production requirements. It manufactures its spring product line during the first four months of the year and would like to employ a strategy that minimizes production costs while meeting the demand during these four months. The Company presently has, on its rolls, 30 employees with an average wage of ₹ 1,000 per months. Each unit of the product requires 8 man-hours. The Company works on single shift basis (8 hrs. shift/day). Hiring an employee costs ₹ 400 per employee per occasion and discharging an employee costs ₹ 500 per person per occasion. Inventory carrying costs are ₹ 5/unit/month and shortage costs are ₹ 100/unit/month. The Company forecasts the demand for the next four months as below: 5

Month	Demand (Units)	No. of working days in the month
January	500	22
February	600	19
March	800	21
April	400	21

The Company is thinking of adopting one of the following strategies:

Plan I: Vary work force levels to meet the demand.
Plan II: Maintain 30 employees and use inventory and stock-outs to absorb demand fluctuations.
Which strategy would you recommend? You may assume nil inventory at the start.

(d) What are the cost factors on which any equipment is replaced?

Answer:

2. (a) Expected time before failure.
= 0.20 x 1 + 0.05 x 2 + 0.20 x 3 + 0.20 x 4 + 0.15 x 5 + 0.20 x 6 = 3.65 months
Therefore number of repair / machine / annum = 12 / 3.65
Considering 20 machines and ₹ 200 to attend a failed machine the yearly cost of Servicing =12/3.65 x 20 x 200 = ₹ 13150.685 = say, ₹ 13151

(b) Standard performance per week = (48 x 60) / 320 = 9 components
Actual performance per week =12 components; Efficiency level =12/9x100 = 133.33%.
As the performance level exceeds 110%, 130% of the basic wages are payable.
Wage Rate = (₹ 5 x 130) /100 = ₹ 6.50 per hour
Labour cost (48 x 5 x 130) / (12x 100) = ₹ 26.00
Material cost = ₹ 20.00
Overhead cost @ 150% of direct Labour = ₹ 39.00
Total cost per component = ₹ 85.00

(c) The overall costs of both the strategies are computed in the following tables:
Plan I: Varying the work force levels to suit the production needs:

	January	February	March	April	Total
1.Workers required	500 / 22 = 23	600 /19 =32	800 / 21 = 38	400/21 = 19	
2. Labour Cost	23,000	32,000	38,000	19,000	1,12,000
3. Hiring Cost		9 x 400 = 3,600	6 x400 = 2,400		6,000
4. Lay-off cost	7x 500 = 3500			19x500 = 9,500	13,000
				Total	1,31,000

Plan II: Maintain a steady work force and use of inventory plus stock-outs to absorb

demand fluctuations:

	January	February	March	April	Total
1. Workers used	30	30	30	30	
2. Labour Cost	30,000	30,000	30,000	30,000	1,20,000
3. Units produced	660	570	630	630	
4. Inventory Costs	5 x 160 = 800	5x130 = 650		5 x 190 = 950	2,400
5. Storage costs			100x40 = 4000		4,000
				Total	1,26,400

On the basis of costs, plan II would be the choice. Moreover this strategy would result in higher worker morale, smoother production, and generally, a higher quality product.

(d) The replacement plan depends on evaluation of present and replacement machines from the point of view of technical suitability and cost saving features. The points to check for replacement studies vary from industry to industry on management conditions and management policies. But some factors are common to practically all cases. The cost factors to be considered before replacement of machines by better ones are of the following nature:

Cost Factors:

(i) High repair cost of existing machine,
(ii) High remodelling cost of existing machine,
(iii) Less chance of spoilage and rejection work causing saving in cost,
(iv) Faster rate of production causes lower cost,
(v) Replacement of skilled -workers by semi-skilled and unskilled workers leading to lesser labour cost,
(vi) Compactness of the machine leading to a saving in-space which means saving of overhead costs,
(vii) Machine payback period i.e. how soon the cost of the equipment is recovered,
(viii) Life of the new machine giving effective service,
(ix) Flexibility and versatility of the machine tending to reduce idle time cost with changes in methods of production which might occur in future,
(x) Availability of funds for the acquisition of the equipment or possibility of special arrangement like hire-purchase or government/bank loans or other accommodations.

3. (a) The work-study engineer carries out the work sampling study in a machine shop for a duration of 120 hours. The following observations were made: 5

Total number of observations	**7000**
No working activities	**1200**
Ratio between manual to machine elements	**2 : 1**
Average rating factor	**120%**
Total number of jobs produced during study	**800 units**
Rest and personal allowances	**17%**

Compute the standard time for the job.

(b) Put an appropriate word or two in blank position: 1x5

(i) A protable platform on which goods are placed to form a 'unit' load for handling and stacking is called a _____.

(ii) _____ in the network analysis represents the difference between the maximum time available to finish the activity and the time required to complete it.

(iii) The _____ layout involves the movement of men and materials to the

product, which remains stationary.

(iv) (Hours worked for maintenance)/(Scheduled hours) x 100 = _____ of department.

(v) By using _____ , the automatic placement and withdrawal of parts and products into and from designated storage places in the warehouse are achieved.

(c) "The principles of materials handling can be grouped under three broad headings." What are these three groups? 3

(d) With the help of the following data, project the trend for the next five years: 5

Year	2002	2003	2004	2005	2006	2007
Sales (₹ Lakhs)	100	110	115	120	135	140

Answer:

3. (a) (i) Overall time per unit (To)= Duration of study/Number of jobs produced during study
= (120 x 60) / 800 = 9 min.

(ii) Effective time per piece (Te) = To x (Productive observations / Total observations)
= 9 x (5800 / 7000) = 7.46 min.

The effective time is to be segregated into manual time and machine element time.

Machine controlled time per piece (T_m) = 7.46 x 1/3 = 2.49 min

Hand controlled time per piece (T_h) = 7.46 × 2/3 = 4.97 min

Normal time per piece = $T_m + T_h$ x performance rating
= 2.49 + 4.97 x 1.2 = 8.46 min.

Standard time per piece = 8.46 (1 + 0.17)
= 9.9 minutes.

(b) (i) Pallet ;
(ii) Float ;
(iii) Static or Fixed Position;
(iv) Performance;
(v) ASRS or Automated Storage and Retrieval System

(c) Materials handling is a service function; it is not an end in itself. The principles of materials handling can be grouped under three broad headings:
- Principles relating to the elimination of wasteful methods,
- Principles relating to the laying out the plant,
- Principles relating to the selection and application of materials handling equipment.

(d)

Year	Time deviations	Sales (₹ Lakhs)	Squares of time deviation	Product of time deviation and sales
	X	Y	X^2	XY
2002	-5	100	25	-500
2003	-3	110	9	-330
2004	-1	115	1	-115
2005	1	120	1	120
2006	3	135	9	405
2007	5	140	25	700
n=6	ΣX = 0	ΣY=720	ΣX^2 = 70	ΣXY = 280

Regression equation of Y and X:
Y = a + bX

To find the value of a and b:
a = $\Sigma Y/n$ = 720/6=120
b = $\Sigma XY / \Sigma X^2$ = 280 / 70 = 4

Sales forecast for the next 5 years i.e. 2008 to 2012
Y_{2008} =120 + 4 (+7) = 120 + 28 = ₹ 148 lakhs.
Y_{2009} =120 + 4 (+9) = 120 + 36 = ₹ 156 lakhs
Y_{2010} =120 + 4 (+11) = 120 + 44 = ₹ 164 lakhs
Y_{2011} =120 + 4 (+13) = 120 + 52 = ₹ 172 lakhs
Y_{2012} = 120 + 4 (+15) = 120 + 60 = ₹ 180 lakhs

4. (a) A company which is planning to undertake the production of medical testing equipments has to decide on the location of the plant. Three locations are being considered, namely, A, B and C. The fixed costs of three locations are estimated to be ₹ 30 lakhs, ₹ 50 lakhs and ₹ 25 lakhs respectively per annum. The variable costs are ₹ 300, ₹ 200 and ₹ 350 per unit respectively. The average sales price of the equipment is ₹ 700 per unit. **3+2**

Find:
(i) The range of annual production/sales volume for which each location is most suitable.
(ii) Select the best location from profitability at a sales volume of 18,000 units.

(b) Indian Electronics manufactures TV sets and carries out the picture tube testing for 2000 hours. A sample of 100 tubes was put through this quality test during which two tubes failed. If the average usage of TV by the customer is 4 hours/day and if 10,000 TV sets were sold, then in one year how many tubes were expected to fail and what is the mean time between failures for these tubes? 5

(c) Expand the following: 1x5
(i) AGV
(ii) GERT
(iii) SPT
(iv) MTBF
(v) IBFS

(d) A small manufacturing firm produces two types of products - A and B, which are first processed in the foundry, and then sent to the machine for finishing. The number of labour-hours required in each shop for the production of each unit of A and B as well as the number of labour-hours the firm has available per week are as follows: 3

	Foundry	Machine Shop
Product A: Labour hours/unit	**20**	**10**
Product B: Labour hours/unit	**6**	**4**
Firm's Capacity per week (in Labour hours)	**1500**	**900**

The profit on the sale of A is ₹ 40 per unit as compared to B's ₹ 30 per unit.
Construct the equation for the objective function and the corresponding constraints by introducing Slack variables under Simplex method of linear programming for an optimal solution.

Answer:

4. (a) Determination of total costs of three locations:
Total cost = Fixed cost + [volume or quantity produced] x [variable cost]
= F + x.v where 'x' is the quantity to be produced and V is the variable cost.
a. Total cost at A = 30,00,000 + 300x ..... (1)

b. Total cost at B = 50,00,000 + 200x.....(2)
c. Total cost at C = 25,00,000 + 350x.....(3)

For the various volumes of production, i.e., 5,000, 10,000, 15,000,20,000 and 25,000 units, the total costs are computed at the three locations as under:

Table: Total costs at different volumes for three locations (₹ in Lakhs)

Volume (Nos.)	5000	10,000	15,000	20,000	25,000
A	45	60	75	90	105
B	60	70	80	90	100
C	42.5	60	77.5	95	112.5

(i) Trend from the above Table:
(a) For quantities up to 10,000 units, Location C is most suitable;
(b) Between 10,000 to 20,000 units, suitable location is A; but beyond 20,000 units, Location B is most economical.

(ii) When the sales volume is 18,000 units, profitability may be drawn as under:

Sl. No.	Item Description	Location		
		A	B	C
1	Sales volume - Units	18,000	18,000	18,000
2	Variable Cost / Unit ₹	300	200	350
3	Total Variable Cost [(l) x (2)] ₹	54,00,000	36,00,000	63,00,000
4	Fixed Cost ₹	30,00,000	50,00,000	25,00,000
5	Total Cost [(3) + (4)] ₹	84,00,000	86,00,000	88,00,000
6	Sales Price / Unit ₹	700	700	700
7	Sale Value [(l) x (6)] ₹	126,00,000	126,00,000	126,00,000
8	Profit [(7) - (5)]	42,00,000	40,00,000	38,00,000

For sales volume of 18,000 units, A is the preferred location.

(b) The total test time = (100 tubes) x 2000 hours = 200,000 tube-hours.
There are two tubes which have failed and hence the total time is to be adjusted for the number of hours lost due to the failures during the testing.
The lost hours are computed as = 2 x (2000 / 2) = 2000 hours.
The assumption is made here is that each of the failed tubes have lasted an average of half of the test period.
Therefore, the test shows that there are two failures during (2,00,000 - 2000) = 1,98,000 tube hours of testing.
During 365 days a year (four hours a day) for 10,000 tubes the number of expected failures (2 / 1,98,000) x 10,000 ×365 X 4 = 147.47 =148 tubes approximately.
Mean time between failures = 1,98,000 tubes hrs. of testing / 2 failures = 99,000 tubes hours per failure = 99,000 / (4 x 365) = 67.8 tubes year per failure.

(c) :
(i) AGV: Automated Guided Vehicle
(ii) GERT: Graphical Evaluation & Review Technique
(iii) SPT: Shortest Processing Time
(iv) MTBF: Mean Time between Failures
(v) IBFS: Initial Basic Feasible Solution

(d) Let, Product A is x and Product B is Y
Introducing the Slack variables S_1 and S_2
The equation can be developed as follows
Objective function is,

$$\text{Max } Z = 20x + 6y + 1S_1 + 0S_2$$

Subject to,

$$20X + 6Y + 1S_1 + 0S_2 = 1,500$$
$$10X + 4Y + 0S_1 + 1S_2 = 900$$

$$X, Y, S_1, S_2 \geq 0 \text{ (Non – Negative)}$$

Section II: Information Systems

Answer Question No. 5 which is compulsory and any two questions from the rest, under Section II.

5. (a) Match the terms in Column I with the relevant terms in Column II: 0.5x8

Column I	Column II
(A) Dumb Terminals	(i) Method of using computers as audit tools
(B) Normalization	(ii) Each workstation having equivalent capabilities and responsibilities
(C) Logical operations	(iii) Brain of a DSS
(D)Peer-to-peer architecture	(iv) Information presented in summary format
(E) Mathematical Model	(v) Used for data entry only
(F) EIS	(vi) A data set in the form of graph, picture or frictional diagram
(G) Model Base	(vii) Comparing, selecting and matching of data
(H) Test Deck	(viii) Process of organizing data in a database

(b) Each statement below is either True or False. Indicate the same in your answers: 1x3
- **(i) Disk imaging helps in prevention of damage out of fraud.**
- **(ii) The task of a compiler is to convert the Machine Language Program into Source Program.**
- **(iii) Full duplex data can travel both directions at a time.**

(c) Put an appropriate word or two in blank position: 1x5
- **(i) In _____ language, the flow of control is managed through line number.**
- **(ii) _____ test is also known as sandwich testing.**
- **(iii) A real-time processing system is necessarily an_____ system, but the reverse is not true.**
- **(iv) Virtual Reality is a _____language to simulate the model in such a fashion that it looks like real.**
- **(v) _____ offers an effective system to protect access by unauthorized user from outside.**

(d) For each part below, choose the most appropriate answer out of the four options given against each part: 1x2
- **(i) Particular characteristic of database where data in the database exist permanently: (A) Integrity, (B) Security, (C) Persistence, (D) Consistency.**
- **(ii) A mechanism of defining user profile based on physical parameters and behaviour:**

(A) Biometric Security, (B) Password Security, (C) Network Security, (D)Database Security.

Answer:

5. (a) (A) - (v); (B) - (viii); (C) - (vii); (D) - (ii); (E) -(vi); (F) - (iv); (G) - (iii); (H) - (i);

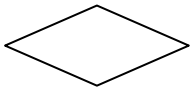
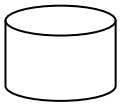
(b) (i) True; (ii) False; (iii) True;

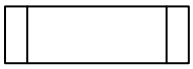
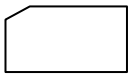
(c) (i) BASIC; (ii) Hybrid; (iii) On-line; (iv) Programming; (v) Firewall.

(d) (i) (B) Persistence; (ii) (A) Biometric Security;

6. (a) (i) What is a System Flow Chart? 2

(ii) What is indicated by each of the following four symbols used in a System Flow Chart? 0.5x4

(A)  **(B)** 

(C)  **(D)** 

(b) What is the purpose of testing of a computer program? Name the various levels of testing. Explain the term 'Structured Walk Through'. 1+2+2

(c) Expand the following and write one or two sentences on each expression to convey its meaning or implication: 1x5

(i) IRG
(ii) EBCDIC
(iii) OLAP
(iv) CASE
(v) EPROM

(d) A manufacturer sells his products to three different types of customers with different discount rates based on order values as under: 4

Customer	Commission on %age on order value		
	Less than ₹ 7,500	₹ 7,500 to less than ₹ 15,000	₹ 15,000 and more
Retailer	5	8	10
Distributor	8	10	15
Govt. Party	8	8	8

Draw the decision table.

Answer:

6. (a) (i) **Systems Flow Chart:** It is a tool to present data flow and process steps in graphical diagrams. Each individual symbol used in the diagram represents a definite element in describing the total flow in the system.

(ii) (A) Decision Box, (B) Magnetic Disk - Database, (C) Process step, (D) Input Document

(b) The purpose of testing is to determine whether the developed or acquired software

achieves its specified requirements. During this process, program design errors or program coding errors may arise. Even insufficiency or inaccurate specifications may be detected. Testing can however detect only presence of errors and not absence of errors.

There are three levels of testing that can be conducted for testing of a program viz. unit testing, integration testing and whole-of-program testing. 'Structured Walk Through' is a type of test where the programmer who designed and coded the module leads other programmers through the module to review the process for detecting errors and irregularities.

(c) (i) IRG - Inter Record Gap. To separate one record from another record, Inter Record Gap (IRG) is maintained in a magnetic tape.

(ii) EBCDIC - Extended Binary Coded Decimal Interchange Code. 8-bit code developed by IBM to represent 256 characters. It is widely used in the world of communication.

(iii) OLAP - On-line Analytical Processing: This software does the analysis of information from data warehouse.

(iv) CASE - Computer Aided Software Engineering: CASE tools are used for having automatic designing assistance with the help of versatile system designing facilities available in them.

(v) EPROM - Erasable Programmable Read Only Memory: This kind of ROM is used for storing programs. It is different from PROM in the sense that earlier program can be erased by lesser rays and new program can be stored there.

(d) As the problem is silent about the no. of person in each category, the question is solved assuming order 1 is of less than ₹ 7,500 and it is also assumed to be from the retailer group, again in case of the 2nd order it is assumed that the order value is greater than equal ₹7,500 and less than ₹15,000 and it is from the distributor group. The total question is solved based on assumption only, hence the answer may vary. Allocation of marks may favorably consider.

		Rules							
		1	2	3	4	5	6	7	8
CONDITION	C1: Order <₹ 7500	Y	Y	N	N	N	N		
	C2: Order>=₹7500 and <₹ 15000	N	N	Y	Y	N	N		
	C3:Order>=₹ 15000	N	N	N	N	Y	Y		
	C4: Customer: Retailer	Y	N	Y	N	Y	N	N	
	C5: Customer: Distributor	N	Y	N	Y	N	Y	N	
	C6: Customer: Govt. Party	N	N	N	N	N	N	Y	
ACTION	A1: Discount 5%	X							
	A2: Discount 8%		X	X				X	
	A3: Discount 10%				X	X			
	A4: Discount 15%						X		

7. (a) A company engaged in steel manufacturing activities is considering the implementation of an ERP system.

The company has a few computerised applications running in different areas of the organisation. All these will be discontinued after ERP system is implemented. 5

A software firm has given a quotation for the new system which states that the implementation will take a little more than a year and the capital cost will be ₹ 85 lakhs (payable as ₹ 55 lakhs in the first year and ₹ 30 lakhs in the second year). The management is wondering as to when the ERP system will recover all of its initial costs and

start making a profit. What would be your answer based on the given data? The following information about Operational Costs (in ₹ lakhs) are also available:

	Year 1	Year 2	Year 3	Year 4	Year 5
Old system	**26**	**28**	**33**	**42**	**45**
New system	**—**	**8**	**16**	**17**	**18**

(b) What is meant by Structured Programming? Enlist the rules of Structured Programming. 1+2

(c) Expand BPR and mention its scope. 1+3

(d) (i) "Integration of information is an important feature of an ERP system." Please establish the statement. 2

(ii) What are the sub-systems in Human Resource Module and Materials Management Module. 2+2

Answer:

7. (a)

End of the year	Operational costs (₹ Lakhs)			
	Old system (a)	New system (b)	Difference (a-b)	Cumulative difference of operational cost
1	26	55	-29	-29
2	28	38	-10	-39
3	33	16	+17	-22
4	42	17	+25	+3
5	45	18	+27	+30

The Pay-back period lies between 3rd and 4th year. Let 'X' be the pay-back period, where cumulative operational cost is 'zero'.

=> (X - 3) / (4 - 3) = 0 - (-22) / 3 - (-22) = 22/25 = 0.88

=> 3 + 0.88 = 3.88 years = 3 years and 10.56 months = 3 years, 10 months and 17 days.

Pay-back period is 3 years, 10 months and 17 days. Hence, the management will recover all of its initial cost and start making profit after that period.

(b) Structured programming means the art of developing programs in a structured fashion to make it readable and maintainable. The rules of structured programming are as follows.

A. Logical flow will have one entry and one exit.
B. Three basic structure:
   - Sequence of execution (DO)
   - If _____GOTO
   - If _____ Then_____ Else
C. No haphazard use of branching using GOTO
D. Top-down or bottom-up approach

(c) Full form of BPR is Business Process Engineering.

Scope of BPR:

- Fundamental rethinking and redesigning of business processes to achieve dramatic improvement in critical measure of performance such as cost, quality, service and speed.
- Process identification - an organization or a department is broken into series of

processes.

- Process rationalization - identification of the value addition by each process and elimination of nonessential processes.
- Process redesign - the remaining processes are redesigned so that they work in most efficient way.
- Process reassembly - the re-engineered processes are implemented resulting in efficient performance in tasks, department and the organization as a whole.

(d) (i) All ERP packages contain a set of modules. These modules are related to different functional areas like Finance, Manufacturing and Production Planning, Materials Management, Selling and Distribution and so on. These modules in a business system have close relationship. An ERP system takes care of the flow of information from different modules and understanding the interactions among them. To avoid data redundancy, data generated from the activity centres are entered and the same data is considered by different modules of the system where the same is relevant for the purpose of understanding the impact of one on the other. This is the basis of integration of information. This is the most important feature of an ERP system.

(ii) **Human Resources Module:** Human Resource Module generally has the following sub-systems:

- **Personnel Management** - HR Master data, personnel administration, Recruitment, Deployment, Transfer etc.
- **Organizational Management** - Job Specification, Staffing Scheduling, Personnel cost planning etc.
- **Payroll Accounting** - Salary Calculation, Income Tax Calculation, Accounting for Fringe Benefits
- **Time Management** - Staff Planning, Work Scheduling, Time Recording, Absence recording etc.

Material Management Module: Material Management Module generally consists of the following sub-systems:

- Material Procurement planning
- Purchasing
- Vendor Evaluation
- Inventory Management
- Material Inspection etc.

8. Write short notes on any six of the following: 3x6

(a) Sort and Merge;
(b) Domain Name;
(c) E-money;
(d) Main features of client-server architecture;
(e) Implementation process in ready-made software;
(f) Data Source;
(g) Functions of the Operating System;
(h) Commonly used Internet Protocols.

Answer:

8. **(a) Sort and Merge:** Sort and merge are two operations which are very common in data processing.
Sorting means reorganizing the file in terms of sequence of a field or fields (sort keys) whereas merging means combining two or more files (having same specifications) on some fields. This is done with the help of a software which takes in an input file, specification of desired fields on which sorting is required and name of the output file. If the input files are more than one, then they are sorted on same fields in order to

produce one output file, and then the files are merged to have one input file as output.

(b) Domain Name: Domain name contains two or more components separated by periods. For example, ibm.com , icmai.in, and aheadindia.org .
The last component stands for the category of domain name as given below:
com - Commercial company
org - organization (non-profit making)
edu - educational institution
net - organization directly involved in internet operation.
gov - government organization etc.

(c) E-money: E-money refers to the digital version of currency and exchange. Digital money moves through a multiplicity of networks rather than via current banking system. Electronic currency substitutes for money on on-line transaction, including secured credit cards, electronic cheques and digital coins.

(d) Main features of client-server architecture: In Client-server processing environment, there is a main machine (may be a main frame) which is called server (host) and which is connected with several terminals (clients) at different locations for the use by users. The server software accepts data fed from clients and returns the results to the clients. Network mechanism provides access permission to multiple users and allows sharing of peripheral devices. The most important point is taking care of transactions at multiple points on-line and facility of instant updation of database and facilitating the fast dissemination of information to clients' users.

In Client Server architecture, the following are the main features:
- It is network based architecture
- Supported by good communication system
- Users are well dispersed
- GUI based operating system
- DBMS software is used
- Open-database connectivity driver (ODBC) and Application Programming Interfaces (APIs)

(e) Implementation process in ready-made software:
Ready-made software means an application package developed with the standard features. As it is for application by wide range of customers, it is developed with adequate flexibility. Cost is comparatively low. Upgraded versions are available with more features at a low additional price.

Implementation process in ready-made software:
- Hardware procurement according to requirement of the software
- Codification and training of personnel and implementation are of standardized procedure.
- There may be a need to change the physical application system according to the codification and the processing need of the system.

(f) Data Source:
Data source may be internal or external. Internal data are from transaction processing of the organization. External data are those which are collected from outside an organization but relevant to the organization for its use. These data may be from published reports from survey, studies, observations or from internet or from other sources. Example -
- Market information
- Product information
- Technology information etc.

(g) Functions of the Operating System: Following are the functions of the operating system:

- **Job Management** - The function includes scheduling of job, activation/ deactivation of processes involved in the job. This is done on the basis of algorithm of scheduling and availability of processor and main memory for carrying out the job.
- **Memory Management** - This involves allocation of main memory space to different jobs and keeping track of it.
- **Device Management** - It involves tracking the status of devices, allocation of various devices to jobs, activate them when needed.
- **File Management** - It involves efficient allocation of separate space for each file, arrangement of protection from loss of data etc.
- **Interaction with operators** - Interpretation of commands from operators, display of error / interruption massage etc.
- **Security** - Function of protecting unauthorized access to system. For this purpose security mechanism through password is followed.
- **Job Accounting** - Keeping track of time and resources used by different jobs etc.

(h) Commonly-used Internet Protocols: There are various internet protocols. Very commonly used protocols are:

1. TCP/IP - Transmission Control Protocol /Internet Protocol
2. HTTP - Hyper Text Transfer Protocol
3. FTP - File Transfer Protocol
4. Telnet - remote login
5. Gopher
6. WAIS - Wide Area Information Service