AF-132

April-2016

4th Year MBA (Integrated)

Quantitative Technique for Management – II

Time : 3 Hours]   **[Max. Marks : 100**

Instructions : (1) Statistical tables will be provided on request.

                  (2) Non-programmable scientific calculator can be used.

1. Answer any **two** :   **10 × 2 = 20**

    (a) A wholesaler supplies a particular product to various retailers and uses the EOQ model for ordering. It is observed that this year holding cost of the product has increased to 15%. Due to an increase in other costs the ordering cost is increased to 20% and annual demand declined by 10%. The wholesaler would like to know the percentage change in both the order quantity and total cost.

    (b) The demand for an item is 24,000 units per year. Its production rate is 4000 per month. The carrying cost is Re 0.25/unit/month and the set-up cost is ₹ 800 per set-up. The shortage cost is ₹ 15/unit/year. Find

       (i) Total cycle time.

       (ii) Period of production as well as consumption of the item satisfying period's requirement.

       (iii) Period of consumption only.

       (iv) Period of shortage.

       (v) period of production as well as consumption of the item satisfying back-order.

    (c) A company purchases 9000 parts of a machine for its annual requirements, ordering one month's usage at a time. Each part costs ₹ 20. The ordering cost per order is ₹ 15 and the carrying charges are 15% of the average inventory per year. Suggest, if more economical purchasing policy for the company is possible. If it is more economical then how much would it save the company per year ?

2. Answer any **two** :   **10 × 2 = 20**

   (a) A job shop has a capacity of 50 hours normal time of production and 20 hours of overtime production every week. The jobs have to processed on three machines A, B and C in the same order. The shop floor manager is taking jobs in serial order. A new job has been received by the shop, which is profitable but floor manager is not ready to accept it as there is not surplus capacity available. The new job would take seven, two and six-hours on the machines A, B and C respectively. Do you support floor manager's view ? Support your answer with reason. Following table gives the processing time of the jobs in hours :

	Job 1	Job 2	Job 3	Job 4	Job 5	Job 6	Job 7
A	9	10	8	6	9	10	5
B	2	2	1	3	3	2	4
C	8	7	6	6	4	1	5

   (b) A person has an availability of two options of investments I_1 and I_2. He has limitation constraint in capital where he cannot undertake both of them simultaneously. He can choose to take I_1 first then stop or if I_1 is completely successful, then only take I_2 and vice-versa. The probability of success on I_1 is 0.7 while for I_2 is 50.4. Both investment require an initial capital outlay of ₹ 2,000 and both return nothing if the nature is unsuccessful. Successful completion of I_1 will return ₹ 3,000 and successful completion of I_2 will return ₹ 5,000. Draw the decision tree and determine the best strategy.

   (c) A stockiest of a perishable commodity want to determine the quantity of the item he should stock to meet the demand. Being a wholesaler he prefers to sell these commodities in multiple of 10 units. From his past experience he knows minimum demand is 10 units and maximum is 50 units. Following is the past record of 200 days demand :

Number of units demanded	10	20	30	40	50
Number of days demand occurred	6	20	80	60	34

   The cost of 10 units put together is ₹ 400 which can sell for ₹ 500 and unsold lot is a net loss.

   (i) Determine EVPI and EPPI.

   (ii) If probability is not known then find the best strategy by savage regret criteria.

3. Answer any **two** :   **10 × 2 = 20**

(a) A manufacturing company is planning to introduce a new product, following tables show the data which consist of variable cost per unit, fixed expenses, selling price per unit and sales volume and probabilities associated with there variables. From the data provided simulate for 10 trials and calculate expected profit. Assume that there is a fixed sale volume for each of the sale prices.

Variable Cost

Variable Cost/Unit (₹)	Probability
4.50	0.10
4.80	0.25
5.00	0.30
5.20	0.20
5.80	0.15

Fixed Expenses (₹)	Probability
10,000	0.10
12,000	0.15
15,000	0.25
20,000	0.30
22,000	0.20

Sales Price/Unit/ (₹)	Sale Volume	Probability
7.00	15,000	0.15
7.30	14,800	0.25
8.00	14,500	0.30
8.50	14,000	0.20
9.00	13,000	0.10

Random Number : 21, 30, 90, 42, 13, 28, 32, 97, 17, 56.

(b)   A company distributes its products by trucks loaded at its only loading station. Both company's trucks and contractor's trucks are used for this purpose. It was observed that on an average, every five minutes one truck arrives and the average loading time is three minutes. 50% of the trucks belong to the contractor. Find out :

(i)   The probability that the truck has to wait.

(ii)   The waiting time of a truck.

(iii) The expected waiting time of contactor's truck per day, assuming a 24 hours shift.

(c)   In a bank with a single server, there are two chairs for waiting customers. On an average one customer arrives every 10 minute and each customer takes 5 minutes for getting served. Making a suitable assumption, find

(i)   the probability that an arrival will get a chair to sit down.

(ii)   the probability that an arrival will have to stand.

(iii) expected waiting time of a customer.

4.   Answer any **two** : $10 \times 2 = 20$

(a)   A truck owner finds from his past experience that the maintenance costs are ₹ 200 for the first year and then increase by ₹ 2,000 every year. The cost of the truck type A is ₹ 9,000. Determine the best age at which to replace the truck. If the optimum replacement is followed, what will be the average yearly cost of owning and operating the truck ? Truck type B costs ₹ 10,000. Annual operating costs are ₹ 400 for the first year and then increase by ₹ 800 every year. The truck owner has now the truck type A which is one year old, should it be replaced with B type and if so when ?

(b)   A large computer installation contains 2000 components of identical nature which are subject to failure as per probability distribution that follows :

Month End	:	1	2	3	4	5
% Failure date	:	10	25	50	80	100

Components which fail have to be replaced for efficient functioning of the system. If they are replaced as and when failure occurs, the cost of replacement per unit is ₹ 45. Alternatively if all components are replaced in one lot at periodic intervals and individually replace only such failures as occur between group replacements, the cost of component replaced is ₹ 15.

(i)   Assess both the policies and find out which policy of replacement is better.

(ii)   If group replacement is economical at current cost then assess at what cost of individual replacement would group replacement be uneconomical.

(c) The marketing division of a powder manufacturing company has worked out the following transition probability matrices concerning the behaviour of the customers before and after an advertising campaign.

Transition Probability Matrix
(Before Advertisement Campaign)

To

$\rightarrow$ Own Brand   Other Brand

From $\downarrow$

	Own Brand	Other Brand
Own Brand	.8	.2
Other Brand	.4	.6

Transition Probability Matrix
(After Advertisement Campaign)

To

$\rightarrow$ Own Brand   Other Brand

From $\downarrow$

	Own Brand	Other Brand
Own Brand	.9	.1
Other Brand	.5	.5

If the advertising campaign costs ₹ 20,000 per year, would it be worthwhile for the company to undertake the campaign ? You may suppose that there are 60,000 buyers of powder in the market and for each customer, the average annual profit the company makes is ₹ 2.50.

5. Answer any **two** :   **10 × 2 = 20**

(a) Protech is a software development company. They hire software developers from two different Engineering Colleges. Over the last year, they have been giving a test to newly graduated engineers entering Protech to determine which college seems to train the students better. Based on the following score out of 100, determine whether the colleges differ in quality using 10% level of significance.

College A: 95 67 71 82 74 90 88 86 82 85 91

College B: 86 97 63 67 95 82 83 87 89 88 85 89 70

(b) Following are the ranking given by students and recruiting companies for top 10 B-schools in a country.

Ranking

B – School	By Student	By Company
School A	2	1
School B	7	4
School C	8	3
School D	9	2
School E	6	6
School F	1	10
School G	3	7
School H	4	8
School I	10	5
School J	5	9

At 0.10 level of significance do the company's ranking differ from student's ranking.

(c) A company produces two products A and B from three raw materials R_1, R_2 and R_3. Currently 40 kg of R_1, 30 kg of R_2 and 40 kg of R_3 are available. One unit of product A sells for ₹ 200 and requires 1 kg of R_1, 1 kg of R_2 and 2 kg of R_3. One unit of product B sells for ₹ 250 and requires 2 kg of R_1, 1 kg of R_2 and 1 kg of R_3. Company is able to sell whatever the quantity of products A and B is produced. Company is interested in maximizing the profit.

Excel sheet solution has been provided. Using that answer the following questions :

(i) If the sell price of product A is increased by ₹ 25, what will be its effect on optimal solution ?

(ii) If the sell price of product B is decreased by ₹ 30, what will be its effect on optimal solution ?

(iii) If the amount available of R_1 is increased by 5, comment on the effect on optimal solution.

(iv) A new product to be introduced with selling price ₹ 200 and consumes resources 2 kg, 1 kg and 2 kg of R_1, R_2, R_3 respectively. Should this product be introduced or not ?

Target Cell (Max)

Cell	Name	Original Value	Final Value
$D$2	Objective Function	5600	5600

Adjustable Cells

Cell	Name	Original Value	Final Value
$B$6	x1	8	8
$C$6	x2	16	16

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
$D$3	R1 Constraint	40	$D$3<=$E$3	Binding	0
$D$4	R2 Constraint	24	$D$4<=$E$4	Binding	0
$D$5	R3 Constraint	32	$D$5<=$E$5	Not Binding	8

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
$B$6	x1	8	0	200	50	75
$C$6	x2	16	0	250	150	50

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
$D$3	R1 Constraint	40	50	40	8	8
$D$4	R2 Constraint	24	150	24	2.666666667	4
$D$5	R3 Constraint	32	0	40	1E+30	8

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