Bachelor of Business Management Degree Programme
Continuous Assessment – June 2016

Year III Semester I ~ BEC 2307 / INB 2307 / MKT 2307 / HLM 2307
Management Science Applications

Instructions for candidates:

Answer all questions.
All Questions carry equal marks.

Question # 01

An investor has the available profitable investment activities A and B for each year of the next five years. Every dollar invested at the beginning of the year in activity A becomes $1.40 two years later. Every dollar invested in the activity B for each year becomes $1.70 three years later. Investment activities C and D will be available shortly. Every dollar invested in C at the beginning of year 2 will become $1.90 at the end of year 5. Every dollar invested in D at the beginning of year 5 will become $1.30 at the end of year 5.

The investor starts with $50,000 and wants to know the way, which will maximize the amount of money he will receive at the beginning of the sixth year. Design an appropriate linear programming model for this investment problem.

Question # 02

A company which manufactures canoes employs 120 employees, each of whom working 30 hours per week. Half of them work in the carpenter department, 20 persons in the plastics department, and the rest of them at the completion department. The company manufactures the simple canoes with net unit profit € 7 and the luxury canoes with corresponding profit € 10. A simple canoe requires 4.5 hours in the carpenter department and two hours in each of the other two departments. The working hours for each luxury canoe are 5, 1 and 4 at the carpenter department, plastics department and completion department respectively. Marketing calculations have shown that not less

than 1/3 and not more than 2/3 of the total number of the canoes should be luxurious. How will the company maximize its overall net profit?

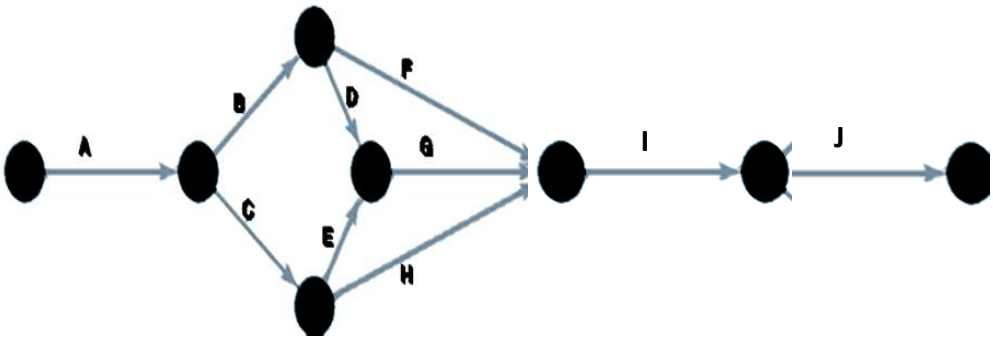
Question # 03

Three refineries with maximum daily capacities of 6, 5, and 8 million gallons of oil supply three distribution areas with daily demands of 4, 8 and 7 million gallons. Oil is transported to the three distribution areas through a network of pipes. The transportation cost is 1 rupee per 100 gallons per mile. The mileage table below shows that refinery R_1 is not connected to distribution area D_3. Formulate the problem as a transportation model and solve it.

		Distribution Area		
		D_1	D_2	D_3
	R_1	120	180	-
Refinery	R_2	300	100	80
	R_3	200	250	120

Question # 04

On the basis of the activity network shown in the following figure and the associated activity times given below, compute the expected duration and the standard deviation of the duration of each activity.



Activity	Optimistic	Most Probable	Pessimistic
A	2	3	4
B	2	4	6
C	1	2	3
D	1	3	5
E	2	3	4
F	1	4	7
G	2	2	2
H	2	5	8
I	1	3	5
J	2	3	4

i. Find the earliest start times, earliest finish times, latest start times, latest finish times, and slack for each activity.
ii. Specify the critical activities.
iii. Find the expected duration and the standard deviation of the duration
iv. What is the probability of finishing the project in at most 17 weeks

The following table gives the estimates of costs for completion in normal time and crash time where the times correspond to the expected time and the optimistic time respectively:

Activity	Crash Cost	Normal Cost
A	20	12
B	50	40
C	40	30
D	20	14
E	60	45
F	35	20
G	30	30
H	25	10
I	30	15
J	12	10

v. Prepare a table showing the normal time, normal cost, crash time, crash cost, maximum crash weeks, and the marginal crash cost for each activity.

vi. What would be the minimum cost of the project if it were to be completed in

   a. 19 weeks?
   b. 18 weeks?
   c. 17 weeks?

Question # 05

i. Discuss the different roles played by the qualitative and quantitative approaches of managerial decision making. Why it is important for a manager or decision maker to have a good understanding in both of these approaches of decision making?

ii. A bank ATM machine can serve customers at an average rate of 20 customers per hour. Also, assume that the customers arrive at the teller's window at an average rate of 15 per hour. Arrivals are believed to follow the Poisson distribution and service time follows the exponential distribution. In the steady state,

   a. When a customer arrives, what is the probability that the teller machine is idle?
   b. What is the probability that the system has exactly 3 customers?
   c. Calculate the other important performance characteristics of this queuing system and interpret each of the characteristics.

Question # 06

i. "**Management Science Application tools are useful in decision making during a war or running a business**" Comment on this statement with examples of your own experience

ii. **"We can apply the Management Science Application tools that we have learnt in solving your day to day problems at our work place**". Describe clearly with examples of your own experience.