RegNo..Name:...

MSc DEGREE END SEMESTER EXAMINATION MARCH 2016
SEMESTER – **4: MATHEMATICS**
COURSE: **P4MATT18EL: OPERATIONS RESEARCH**

Time: Three Hours   Max. Marks: 75

Section A
Answer **any Five** questions. Each question carries 2 marks

1. Explain nonzero lead time.
2. Differentiate between continuous and periodic review systems.
3. Explain queue disciplines.
4. Differentiate between pure birth and pure death models.
5. What are the basic features of dynamic programming?
6. What is Bellman's Principle of Optimality?
7. Define sequencing and explain the terms included.
8. Write any two advantages and limitations of simulation.

(2 x 5 = 10)

Section B
Answer **any Five** questions. Each question carries 5 marks

9. Differentiate between deterministic and probabilistic inventory models.
10. A newspaper publishing concern has to periodically replenish its supply of paper stock. The paper comes in large rolls and the printer uses it up at the rate of 32 rolls per week. The cost of replenishment will be $ 25 plus the cost of paper. The cost of keeping paper on hand, including rent for the space occupied, insurance and interest on the capital tied up will be $1 per week. Calculate the optimal number of rolls to be ordered at a time, time between orders and cost of operating the system.
11. Explain the forgetfulness property of exponential distribution.
12. Explain pure death model.
13. Write the algorithm for single additive constraint, additively separable return.
14. Determine the maximum of $x^2 + y^2 + z^2$ subject to $xyz \leq 6$, where x, y, z are positive integers.
15. Explain the Optimal Sequence Algorithm for determining the optimal sequence for an n jobs and 2 machines sequencing problem.
16. Explain acceptance rejection method.

(5 x 5 = 25)

Section C
(Answer either A or B of each question)

17. a. Discuss newsboy problem in detail and solve it.
    b. Derive EOQ formula without shortage and with shortages allowed.

18. a. B & K Groceries operates with three checkout counters. The sign-by check out area advises the customers that an additional counter will be opened any time the number of customers in any lane exceeds three. This means that for fewer than four customers, only one counter will be in operation. For four to six customers, two counters will be open. For more than six customers all the three counters will be open. The customers arrive at the counters area according to a Poisson distribution, with a mean of 10 customers per hour. The average check-out time per customer is exponential with mean 12 minutes.
    Determine the steady state probability p_n of n customers in the check-out area. Also, calculate all the steady state performance measures.
    b. Explain in detail about $(M/M/1):(GD/\infty/\infty)$ model.

19. a. Define decomposable problem and prove that in a serial two stage minimization or
    maximization problem, if the objective function ϕ_2 is a separable function of the stage
    returns $f_1(X_1, U_1)$ and $f_2(X_2, U_2)$ and ϕ_2 is a monotonic non-decreasing function of f_1 for
    every feasible value of f_2, then the problem is decomposable.
    b. Maximise $x^2 + y^2 + z^2$ subject to $xyz \leq 6$ and $x + y + z \leq 6$ where x, y, z are positive
    integers.

20. a. Determine the optimal sequence of jobs that minimizes the total elapsed time based on
    Thefollowing information (Processing time on machines is given in hours and passing is
    not allowed)

Machines	Jobs						
	A	B	C	D	E	F	G
M_1	3	8	7	4	9	8	7
M_2	4	3	2	5	1	4	3
M_3	6	7	5	11	5	6	12

    b. Explain Monte Carlo method and compute the area of the circle $(x – 1)^2 + (y – 2)^2 = 25$.

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(10 x 4 = 40)