G 2358 (Pages : 3) Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2015

Fourth Semester

Faculty of Science

Branch I (A)—Mathematics

MT04 E07—OPERATIONS RESEARCH

(2012 Admission onwards—Regular/Supplementary)

Time : Three Hours Maximum Weight : 30

Part A

Answer any **five** *questions.*
Each question has weight 1.

1. Explain the objectives of inventory control.
2. What is a production lot size model ?
3. Explain the forgetfulness property of exponential distribution.
4. Explain the elements of a queuing model.
5. What are the characteristics of Dynamic Programming ?
6. Explain the principle of optimality.
7. What is simulation ? What are the steps in it ?
8. There are n jobs to be processed on three machines, each job requiring the same sequence of operations and no passing is allowed. Stating the assumptions, explain how, you would determine the sequencing of jobs which is optimal.

$(5 \times 1 = 5)$

Part B

Answer any **five** *questions.*
Each question has weight 2.

9. Obtain the formula for classical EOQ without shortage.
10. The demand for a purchased item is 1000 units/month and shortages are allowed. Unit cost is Rs. 1.50 per unit cost of making one purchase is Rs. 600. Holding cost is Rs. 2 per unit per year and the cost of one shortage is Rs. 10 per year. Find optimum purchase quantity.

Turn over

11. For the Poisson queueing model $(M|M|1):(GD|\infty)$ find an expression for average number of customers in the system.

12. Explain (i) traffic intensity ; (ii) utilisation factor ; (iii) steady and transient state ; (iv) queue discipline.

13. Explain minimum path problem. How dynamic programming is used to solve it ?

14. Use dynamic programming to :

Maximise $z = x_1^3 + x_2^3 + x_3^3$

subject to $x_1 x_2 x_3 = 27,$
$x_1, x_2, x_3 \geq 0.$

15. Explain maintenance crew scheduling. Also state the rules when the service times are given in the rows form.

16. State Central Unit theorem. Illustrate the implementation of the Box-Miller procedure to the normal distribution N (10, 2). Discuss the efficiency of this method.

$(5 \times 2 = 10)$

Part C

Answer any **three** *questions.*
Each question has weight 5.

17. Describe the production lot-size model. Obtain an expression for optimal PLS.

18. Describe the waiting time distribution for $(M|M|1):(FCFS|\infty|\infty)$ and obtain its mean.

19. A barbershop has two barbers and three chairs for customers. Assume that customers arrive in Poisson fashion at a rate of 5 per hour and each barber services with mean of 15 minutes. Further, if a customer arrives and if there are no empty chairs, he will leave. What is the probability that the shop is empty ? What is the expected number of customers in the shop ?

20. Use dynamic programming to :

Maximize $z = 3x_1 + 5x_2$

subject to the constraints $x_1 \leq 4, x_2 \leq 6$
$3x_1 + 2x_2 \leq 18$
and $x_1, x_2 \geq 0.$

21. We have five jobs, each of which must go through two machines A and B in the order AB. Processing times in hours are given below :

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

22. Suppose that the demand is normally distributed with mean 175 and standard deviation 25 units per day. Simulate the demand for the next 20 days.

$(3 \times 5 = 15)$