INDIRA GANDHI NATIONAL OPEN UNIVERSITY(IGNOU)-2005

B.TECH DEGREE EXAMINATION

SYSTEM METHODS

(CIVIL ENGINEERING)

TIME-3HOUR
MARKS-70

NOTE: ALL QUESTIONS ARE COMPULSORY. USE OF CALCULATORS IS ALLOWED.

1. Answer any six questions : (5x6=30)

(a) Describe the temperature control system of human body with the help of block diagram.

(b) what are piezo-electric crystals? Where do you find their applications?

(c) What are the different types of electrical heating processes? Illustrate each with the help of suitable examples.

(d) Why is the D.C. series motor selected for electric traction? What are the methods of controlling the speed of (i) separately excited, (ii) shunt, and (iii) series motors ?

(e) Lead screw is a device, which transforms circular motion of the driving motor into to-and-fro motion. Describe a motion transformer which converts rectilinear motion into circular motion.

(f) Cite at least one example each of hydraulic, mechanical, thermal and electro-mechanical control systems. Explain their operation with the help of block diagrams.

(g) Draw a block diagram for water level control system. Identify reference input, error and output signals.

(h) What are various types of physical models? Give at least one example of each type.

(i) What is the purpose of pump in fluidity system? What are the typical applications of positive displacement pump?

(j) Explain D'Alembert's principle. Draw a free body diagram for spring - Mass - Damper system.

2. Answer any two of the following : (10x:2=20)

(a) A scrap metal, dealer has received a bulk order from a custome r for a supply of at least 8000 kg of scrap metal. The customer has specified that at least 4000 kg of the order must be of high quality copper that can be melted easily and can be used to produce tubes. Further, the customer has specified that the order should not contain more than 200 kg of scrap which is unfit for commercial purposes. The scrap metal dealer, purchases scrap from two different sources in an unlimited quantity with the following percentages (by weight) of high quality copper and unfit scrap

Source A Source B
Copper 40% 75%
Unfit scrap 7.5% 10%

The cost of metal purchased from Source A and Source B is Rs. 25 and Rs. 29 per kg respectively. Determine the optimum quantities of metal to be purchased from the two sources by the scrap metal dealer so as to minimize the total cost. Use graphical method to identify the feasible region and comment on the feasibility of solution

(b) Find the initial basic feasible solution to the following Transportation Problem using North West Corner Method. Also obtain the solution by Vogel's approximation method. Compare both the solutions

TABLE

(c) A machine operator processes five types of items on his machine each week and must choose a sequence" for them. The set-up cost per change depends on the items presently on the machine and the set-up to be made according to the following table:

TABLE

If he processes type of item once and only once in each week, how should he sequence the items on his machine, in order to minimize the total set-up cost?

3. Answer any two of the following (10x2=20)

(a) A small maintenance project consists of the following jobs whose precedence relationships is given below :

Job	Duration (Days)
1-2	15
1-3	15
2-3	3
2-5	5
3-4	8
3-6	12
4-5	1
4-6	14
5-6	3
6-7	14

Draw an arrow diagram representing project and find

(i) Total float for each activity,
(ii) The critical path and
(iii) Total project duration.

(b) A booking counter takes 10 minutes to book a ticket for each customer. If the customers are arriving according to a Poisson process, with a rate of 4 per hour, then find out:

(i) Expected queue length,
(ii) Expected waiting time of a customer,
(iii) Expected time a customer spends in the system,
(iv) Expected number of Customers in the system.

(c) Write short notes on the following :

(i) ABC Classification
(ii) Principle of Optimality
(iii) Surplus and Slack variable
(iv) Probabilistic estimates in PERT
(v) Characteristics of a queuing model