Total no. of pages: 1   Mid Semester (February 2015)   Roll No. ....
                         B.Tech.8th Semester (Mathematics & Computing)

Course Name: Mathematical Modeling and Simulation   Course Code: MC 411
Time: 1 hr 30min   Max marks: 20

> Attempt all questions.
> Assume missing data, if any.

1. Write short notes on the following: (6)

    a) Conceptual and Physical model
    b) Stationary and instationary model
    c) Distributed and lumped model

2. A company decided to develop a cost equation based on the quantity of the product
   produced in a day. They collected the following data:

Quantity produced	20	35	50	65	80	95	110
Cost (in Rs)	642.35	766.48	858.82	928.83	1005.32	1078.82	1140.79

    a) Find a good model for the data

    b) According to the model, find how many units could be produced for Rs 800.(7)

3. Fit the following data with a natural spline curve

x	0.0	1.0	1.5	2.25
f(x)	2.0000	4.4366	6.7134	13.9130

Also evaluate the spline values g(0.66) and g(1.75). The true relation is given as
$f(x) = 2e^x - x^2$.   (7)

Paper Code: MC-412-2   Optimization Techniques
Max Marks: 20   Time: 1.5 Hours

- NOTE: Answer all questions. Assume suitable missing data if any.

Q1. (a) Consider the following function: (3)

$$f(x,y) = 2x^2 - 2xy + \frac{1}{2}y^2 + 3x - y$$

   i. Express the function in matrix- vector form.
   ii. Is the Hessian singular ?
   iii. Is f a convex function ? Give reason.

(b) Check whether the following optimization problem is convex or not. (3)
   `Max` $Z = x \, log \, x$

   `subject to :`
$$x^2 + y^2 \geq 0$$
$$x, y \geq 0.$$

Q2. Consider the following Quadratic Programming Problem (QPP)
   `Min` $Z = (x - y)^2 + y$
   `subject to :`
$$-x + y \leq 0$$
$$x + 2y \leq 3$$
$$x, y \geq 0.$$

(a) Express the objective function in the standard Quadratic Programming Problem (QPP) $C^T x + x^T D x$. Is D is positive semidefinite? (2)

(b) Solve the above Quadratic Programming Problem (QPP) by Wolfe's method and identify difficulties if you face any. (5)

Q3. (a) Let $S \subseteq R^n$ be a convex set and $f : S \rightarrow R$. The level set of f is given by $\tau_\alpha = \{x \in S \,|\, f(x) \leq \alpha\}$, $\alpha \in R$. f is a quasiconvex function on S if and only if τ_α is a convex set, for every $\alpha \in R$. (3)

(b) Solve the following fractional programming problem by Charne's and Cooper method
   `Max` $Z = \frac{2x+3y}{x+y+7}$ (4)
   `subject to :`
$$3x + 5y \leq 15$$
$$4x + 3y \leq 12$$
$$x, y \geq 0.$$

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Mid-Semester Examination, February' 2015

B.Tech. (Eighth Semester)
HU-414- Econometrics (Open Elective)

Marks - 20 Mark   Time- 1.30

Attempt all questions. Assume missing value, if any.

1. What do you mean by Econometrics? Discuss its relevance for Engineers.   5

2. Differentiate between   9

  a. Ordinal Scale and Nominal Scale

  b. Time Series data and Cross Sectional data

  c. Stochastic Variable and Non-Stochastic Variable

3. What are the basic ingredients of an empirical Study?   2

4. Discuss relevance of mean in Econometric studies.   2

5. Discuss relevance of Variance in Econometric studies.   2