ME sem II | mech | CBCS | FN2019

27/05/2019

(3 Hours) Marks : 80

1) Attempt any **Four Question**.
2) Make suitable assumptions if required.

Q.1 (a) A manufacturer produces four products, A,B,C, and D, by using two types of machines (lathes and milling machines). The times required on the two machines to manufacture 1 unit of each of the four products, the profit per unit of the product, and the total time available on the two types of machines per day are given below: **15**

Machine	Time required per unit (min) for product: A	B	C	D	Total time available per day (min)
Lathe machine	7	10	4	9	1200
Milling machine	3	40	1	1	800
Profit per unit ($)	45	100	30	50	

Find the number of units to be manufactured of each product per day for maximizing the profit. Also find the effect of changing the total time available per day on the two machines from 1200 and 800 min to 1500 and 1000 min.

(b) Briefly explain phases in RMS. **05**

Q.2 (a) Use Gomory's cutting plane algorithm to solve the following integer programming problem. **14**

Maximize; $Z = X_1 + X_2$

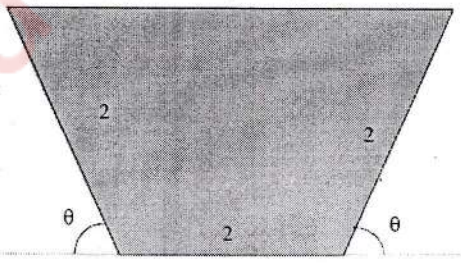
Subject to;

$$3X_1 + 2X_2 \leq 5$$
$$X_2 \leq 2$$
$$X_1, X_2 \geq 0 \text{ and integers}$$

(b) An equation of the form $y=a + (b/x)$ is used to provide a best fit in the sense of least squares, for the following points: (x, y) = (1, 6), (3, 10) and (6, 2). Determine *a* and b. **06**

Q.3 (a) The cross-sectional area of a gutter with equal base and edge length of 2 is given by $A = 4\sin\Theta(1+\cos\Theta)$ **10**

Find the angle Θ which maximizes the cross-sectional area of the gutter by Golden Search Method.



(b) Find the minimum of the function **10**

$f(\lambda) = 0.65 - [0.75/(1+\lambda 2)] - 0.65\,\lambda \tan\text{-}1(1/\lambda)$

Use Quasi-Newton method with the starting point $\lambda 1 = 0.1$ and the step size $\Delta\lambda = 0.01$ in central difference formulas. Use $\varepsilon = 0.01$ for checking the convergence.

Q4 (a) State limitation of Fibonacci Method **05**

(b) State the properties and use of Unimodal Function. **05**

(c) A fuel cylinder is also to generate power by putting a solar power film on its surface. Find the radius(R) and length (l) of a cylinder with maximum volume such that the surface area is given by S. **10**

Use the Lagrange multiplier Method

Q.5 (a) Solve by dual simplex method the following problem. **14**

Minimize ; $Z = 6X_1 + 7X_2 + 3X_3 + 5X_4$

Subject to ; $5X_1 + 6X_2 - 3X_3 + 4X_4 \geq 12$

$X_2 + 5X_3 - 6X_4 \geq 10$

$2X_1 + 5X_2 + X_3 + X_4 \geq 8$

$X_1, X_2, X_3, X_4 \geq 0$

(b) Write a short note on Monte – Carlo techniques **06**

Q.6 (a) Maximize the $f(X) = X(5\pi - X)$ in the interval of [0,20] by the Fibonacci method using $n = 7$. **10**

(b) Using the method of lagrangian multipliers solve the following problem. **10**

Optimize ;

$Z = X_1^2 + X_2^2 + X_3^2$

Subject to;

$X_1 + X_2 + 3X_3 = 2$

$5X_1 + 2X_2 + X_3 = 5$

$X_1, X_2, X_3 \geq 0$
