Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech S1 (R,S) Exam Dec 2020

Cluster: **Kollam**

Branch: **Electrical and Electronics Engineering**

Subject: **02EE6111/02EE6211 ADVANCED ENGINEERING MATHEMATICS**

Time: 3 Hrs Max. Marks: 60

Instructions: *Answer **All** Questions from **Part A***
*Answer **Two Full** Questions from **Part B***

PART A

1. (a) The joint probability density function of two random variables is given by

$$f(x,y)=\begin{cases} c\,(1+xy) & 0\le x\le 6,\ 0\le y\le 5 \\ 0 & \textit{otherwise} \end{cases}$$

Find (i) the constant c (ii) $f(x/3)$.

(b) An electric firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hrs. Find (i) The probability that a bulb burns more than 834 hrs.

(ii) The probability that a bulb burns between 778 and 834 hrs.

2. (a) Minimize $f(x_1,x_2)=x_1-x_2+2x_1^{\,2}+x_2^{\,2}+2x_1x_2$ by using the Conjugate gradient Method with starting point (0, 0).

(b) Use dynamic programming method to solve the following problem.

Maximize $Z=x_1+9x_2$ subjected to

$2x_1+x_2\le 25$, $x_2\le 11$, $x_1,x_2\ge 0$.

3. (a) Prove that $J_{-n}(x)=(-1)^n J_n(x)$.

(b) State and prove Rodrigues formula

4. (a) Solve by dual simplex method, Maximize $Z=-2x_1-x_2$ subjected to

$-3x_1-x_2\le -3$, $-4x_1-3x_2\le -6$, $-x_1-2x_2\le -3$, $x_1,x_2,x_3\ge 0$.

(b) Solve the integer programming problem Max $Z=2x_1+3x_2$ subjected to

$6x_1+5x_2\le 25$, $x_1+3x_2\le 10$, x_1,x_2 are non-negative integers using Branch and Bound method.

(4x9=36)

P.T.O

PART B

5. (a) Check whether $(2,-5,3)$ can be expressed as the linear combination of vectors $v_1 = (1.-3,2)$, $v_2 = (2.-4,-1)$ and $v_3 = (1.-5,7)$.

(b)Use Gram Schmidt process finds an orthonormal basis of R^4 for the subspace spanned by (1,1,1,1), (1,1,2,4), (1,2,-4,-3).

6. (a) Find a curve on which the functional $I = \int_0^1 (y'^2 + 12xy)\, dx$ with $y(0) = 0, y(1) = 1$ can be extremised.

(b) Find the extremal of the functional $\int_{x_1}^{x_2} (y^2 + y'^2 + 2ye^x)\, dx$

7. (a) Prove that the sphere is a solid figure of revolution which for a given surface area has maximum volume.

(b) Find the QR decomposition of A = $\begin{bmatrix} 3 & -6 \\ 4 & -8 \\ 0 & 1 \end{bmatrix}$

(2x12=24)