Annexure No-12

ISSN 0304-9892

Jñānābha ज्ञानाभ

VOLUME 31/32

Special Volume to Honour

Professor H.M. Srivastava
on his 62nd Birthday

2002

Published by :
The Vijñāna Parishad of India
DAYANAND VEDIC POSTGRADUATE COLLEGE
(Bundelkhand University)
ORAI, U.P., INDIA.

31

Jñānābha, Vol. 31/32, 2002
(*Dedicated to Professor H. M. Srivastava on his 62nd Birthday*)

INTEGRALS INVOLVING MULTIPLE HYPERGEOMETRIC FUNCTIONS OF SEVERAL VARIABLES THROUGH DIFFERENCE OPERATOR APPROACH

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(*Received : December 29, 2002 ; final form: August 20, 2003*)

ABSTRACT

In the present paper, making an appeal to difference operators, we evaluate certain integrals involving multiple hypergeometric functions of Chandel-Gupta [3], Exton [6,7] and Karlssoń [10]. We also apply same technique to evaluate integrals involving Appell's functions [1] and their confluent forms due to Humbert [8] and hypergeometric functions of four variables due to Sharma and Parihar [12,13].

1. Introduction. Recently, making an appeal to difference operator E_α defined by

(1.1) $\quad E_\alpha f(\alpha) = f(\alpha+1), \qquad E_\alpha^m(f(\alpha)) = f(\alpha+m),$

and integral due to Erdélyi [5.p.224]

$$(1.2) \quad \int_{-\infty}^{\infty} \frac{\sin[(m+1)\pi x]dx}{\sin \pi x\Gamma(\alpha_1+x)\Gamma(\alpha_2-x)} = \frac{2^{\alpha_1+\alpha_2-2}}{\Gamma(\alpha_1+\alpha_2-1)}, \qquad Re\,(\alpha_1+\alpha_2)>1,$$

Joshi and Bhati [9] evaluated some integrals involving hypergeometric functions of three and four variables and discussed some special cases.

Very recently, making an appeal to difference operators Chandel [2] obtained various transformations of multiple hypergeometric functions of several variables due to Chandel-Gupta [3], Chandel-Vishwakarma [4] and discussed their interesting special cases.

In the present paper, making an appeal to difference operators, we evaluate certain interesting integrals involving multiple hypergeometric functions of several variables $F_A^{(n)}$, $F_C^{(n)}$ and confluent form $\psi_2^{(n)}$ of Lauricella [11], ${}^{(k)}F_{AC}^{(n)}$, ${}^{(k)}F_{AD}^{(n)}$ and confluent form ${}^{(k)}_{(1)}\phi_{AC}^{(n)}$ of Chandel-Gupta [3], ${}^{(k)}_{(1)}E_D^{(n)}$ of Exton [6,7], ${}^{(k)}F_{CD}^{(n)}$ of Karlsson [10]. As byproduct, we also evaluate integrals involving functions F_1, F_2 of two variables due to Appell [1] and their confluent form Ξ_2 due to Humbert [8].

In the last, we also apply difference operational technique to evaluate integral involving hypergeometric functions $F_{29}^{(4)}$ and $F_{58}^{(4)}$ of four variables introduced by Sharma and Parihar [12,13].

2. Applications to evaluate integrals. Multiplying both sides of (1.2) by

(32)