



FEDERAL PUBLIC SERVICE COMMISSION  
COMPETITIVE EXAMINATION FOR  
RECRUITMENT TO POSTS IN BPS-17 UNDER  
THE FEDERAL GOVERNMENT, 2010

Roll Number

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APPLIED MATH, PAPER-II

TIME ALLOWED: 3 HOURS

MAXIMUM MARKS:100

NOTE:

- (i) Attempt **FIVE** question in all by selecting at least **TWO** questions from **SECTION-A**, **ONE** question from **SECTION-B** and **TWO** questions from **SECTION-C**. All questions carry **EQUAL** marks.  
(ii) **Use of Scientific Calculator is allowed.**

SECTION – A

- Q.1.** Solve the following equations:  
(a)  $d^2y/dx^2 + 5 dy/dx + 6y = x$  (10)  
(b)  $d^2y/dx^2 + 5 y x = e^x$  (10)
- Q.2.** (a) Derive Cauchy Riemann partial differential equations. (10)  
(b) Derive Laplace Equation. (10)
- Q.3.** Solve:  
(a)  $(\partial^2 / \partial x^2 + \partial^2 / \partial x \partial y + \partial^2 / \partial y^2) u = 4 e^{3y}$  (10)  
(b)  $u'' + 6u' + 9 = 0$ ; Given that  $u(0) = 2$  and  $u'(0) = 0$ . (10)

SECTION – B

- Q.4.** (a) Discuss the following supported by examples:  
• Tensor, (5)  
•  $\epsilon_{ijk} \epsilon_{lmk}$  (5)  
• Scaler Fields for a continuously differentiable function  $f=f(x,y,z)$  (5)  
(b) Can we call a vector as Tensor, discuss.  
What is difference between a vector and a tensor?  
What happens if we permute the subscripts of a tensor? (5)
- Q.5.** (a) Discuss the simplest and efficient method of finding the inverse of a square matrix  $a_{ij}$  of order  $3 \times 3$ . (10)  
(b) Apply any efficient method to compute the inverse of the following matrix A: (10)

$$A = \begin{bmatrix} 25 & 2 & 1 \\ 2 & 10 & 1 \\ 1 & 1 & 4 \end{bmatrix}$$

SECTION – C

- Q.6.** (a) Develop Gauss Seidel iterative Method for solving a linear system of equations  $Ax = b$ , where A is the coefficient matrix. (10)  
(b) Apply Gauss Seidel iterative Method to solve the following equations: (10)  
 $25X_1 + 2X_2 + X_3 = 69$   
 $2X_1 + 10X_2 + X_3 = 63$   
 $X_1 + 2X_2 + X_3 = 43$
- Q.7.** (a) Derive Simpson's Rule for finding out the integral of a function  $f(x)$  from limits  $x=a$  to  $x=b$  for  $n=6$  subintervals (i.e. steps). (10)  
(b) Apply Simpson's Rule for  $n=6$  to evaluate: (10)  
 $\int_0^1 f(x) dx$  where  $f(x) = 1/(1+x^2)$ .
- Q.8.** (a) Derive Lagrange Interpolation Formula for 4 points: (10)  
(b) A curve passes through the following points:  
(0,1), (1,2), (2,5), (3,10). Apply this Lagrange Formula to interpolate the polynomial. (10)

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