1991

B. E. 2nd Semester Examination,

May–2013

MATHEMATICS–II

Paper–Math–102–E

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt five questions in all taking at least one from each part. All questions carry equal marks.*

Part–A

1. (a) Find the rank of the matrix by reducing into the normal form

$$\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$$

(b) Find the inverse of the following matrix using elementary transformations

$$\begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$$

2. (a) Discuss the consistency of the system of equations :

$$2x - 3y + 6z - 5w = 3,$$

$$y - 4z + w = 1,$$

$$4x - 5y + 8z - 9w = \lambda$$

for various value of λ, if consistent, find its solution.

(b) Find the eigen values and the corresponding eigen vectors of the matrix

$$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

Part–B

3. (a) Solve :

$$x\,dy - y\,dx = (x^2 + y^2)\,dx$$

(b) If the air is maintained at 30°C and the temperature of the body cools from 80°C to 60°C in 12 minutes, find the temperature of the body after 24 minutes.

4. (a) Solve :

$$\frac{d^2y}{dx^2} + 4y = x \sin x$$

(b) Solve by method of variation of parameters

$$y'' + y = \tan x$$

5. (a) Solve :

$$x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2 \log x$$

(b) Solve the following system of simultaneous differential equations

$Dx - y = t$ and

$Dy + x = 1$ where $D = \frac{d}{dt}$

Part–C

6. Find the Laplace transforms of the following functions

(a) $t^2 e^{-3t}$

(b) $t^2 e^{-3t} \sin 2t$

(c) $\frac{\cos at}{t}$

(d) $\cos 2t \cos 3t$

7. (a) Find the inverse Laplace transforms of the following

(i) $\frac{s+2}{s^2-4s+13}$

(ii) $\tan^{-1}\frac{2}{s}$

(b) Apply convolution theorem to evaluate the inverse of

$$\frac{1}{(s+a)(s+b)}$$

8. (a) Solve :

$(x^2-2yz-y^2)p+(xy+zx)q=xy-zx$

(b) Solve the following differential equation by using Charpit's method

$(p^2+q^2)x=pz$