

Roll No ...

MA-111

B.E. I &amp; II Semester

Examination, June 2017

Choice Based Credit System (CBCS)

Mathematics - II

Time : Three Hours

Maximum Marks: 60

Note: i) Attempt any five questions out of eight questions.

ii) All questions carry equal marks.

1. a) Find rank and nullity of the following matrix by reducing

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

it to the normal form:

b) Solve  $\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} - \frac{dy}{dx} - y = \cos 2x + 3e^x$

2. a) Find Eigen values and Eigen vectors of the matrix

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

b) Verify Cayley-Hamilton theorem for the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

[2]

3. a) Solve  $\frac{dy}{dx} = 1 + x + y + xy$ .

b) Solve  $(1 + y^2) dx = (\tan^{-1} y - x) dy$

4. a) Solve  $(1 + 4xy + 2y^2) dx + (1 + 4xy + 2x^2) dy = 0$

b) Solve  $\frac{d^2 y}{dx^2} + 4y = e^x + \sin 2x$

5. a) Solve the simultaneous differential equations

$$\frac{dy}{dt} + y = \sin t; \frac{dy}{dt} + x = \cos t$$

b) Solve  $\frac{d^2 y}{dx^2} - \cot x \frac{dy}{dx} - (1 - \cot x) y = e^x \sin x$

6. a) Using method of removal of first derivative, solve the

$$\text{equation } \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} + (x^2 + 1) y = x^3 + 3x$$

b) Using the method of variation of parameter, solve the

$$\text{differential equation } \frac{d^2 y}{dx^2} + y = \operatorname{cosec} x$$

7. a) Solve  $x^2 p^2 + y^2 q^2 = z^2$ .

b) Solve  $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 12xy$ .

8. a) Using Lagrange's method, solve the equation  $yzp + zxq = xy$ .b) Using Charpit's method, solve  $px + qy = pq$ .

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