2E2301

Roll No.

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B. Tech. II Sem. (Main) Exam., May – 2018

MA-102 Engineering Mathematics - II

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

Attempt any ***five questions*** *including Question No. 1, which is Compulsory. All questions carry* ***equal*** *marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use *of following supporting material is permitted during examination. (Mentioned in form No.205)*

1. NIL

2. NIL

Q.1 COMPULSORY.

Answers for each sub-question be given in about 25 words -

(a) Define rank of a matrix. [2]

(b) Find the Eigen values of the matrix - [2]

$$\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

(c) Write Euler's formulae for the Fourier series in the interval $(-\pi, \pi)$. [2]

(d) Determine b_n for the Fourier series of the function : [2]

$$f(x) = x, \; -\pi < x < \pi$$

(e) Define linear differential equation by giving an example. [2]

(f) Find CF of following differential equation - [2]

$$(D^3 - 13D + 12)\, y = 0,\ D = \frac{d}{dx}$$

(g) Find PI of following differential equation - [2]

$$x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 2x^2$$

(h) Form the partial differential equation by using the elimination of arbitrary function - [2]

$$z = f\left(\frac{y}{x}\right)$$

Q.2 (a) Find the rank of the matrix - [8]

$$A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$$

after reducing it to the normal form.

(b) Examine the consistency of the system: [8]

$$x + y + z = 6$$

$$2x + y + 3z = 13$$

$$5x + 2y + z = 12$$

$$2x - 3y - 2z = -10$$

and solve them if they are consistent.

Q.3 (a) Find the Eigen values and the corresponding Eigen vectors of the following matrix : $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ [8]

(b) Find the Fourier series for the following function - [6+2=8]

$$f(x) = \begin{bmatrix} -\pi, & \text{for} & -\pi < x < 0 \\ x, & \text{for} & 0 < x < \pi \end{bmatrix}$$

Hence deduce that: $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots\ldots$

Q.4 (a) Obtain the Fourier series for $f(x) = x \cos x$, $-\pi < x < \pi$. [8]

(b) Express y in a Fourier series upto second harmonic for the following table - [8]

x :	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y:	1.98	2.15	2.77	-0.22	-0.31	1.43	1.98

Q.5 (a) Solve the following differential equation - [8]

$$(y + \frac{1}{3}y^3 + \frac{1}{2}x^2)\,dx + \frac{1}{4}(1 + y^2)\,x\,dy = 0$$

(b) Solve - [8]

$$(D^2 + 2D + 1)\,y = e^x + x^2 - \sin x$$

Q.6 (a) Solve - [8]

$$x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 \log x$$

(b) Solve the following differential equation - [8]

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

Q.7 (a) Solve - [8]

$$(y+z)p + (z+x)q = x+y$$

(b) Solve the following differential equation by using Charpit's method - [8]

$$pxy + pq + qy = yz$$
