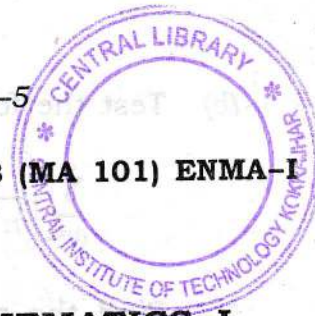


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53 (MA 101) ENMA-I

2021



ENGINEERING MATHEMATICS-I

Paper : MA 101

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) Find degree and order of the following differential equations : $2 \times 2 = 4$

(i)
$$\left[1 + \left(\frac{dy}{dx} \right)^2 \right]^{3/2} = \frac{d^2y}{dx^2}$$

(ii)
$$\frac{d^2y}{dx^2} - \sin\left(\frac{dy}{dx}\right) + y = 0$$

Contd.

(b) Test the following series : 6

$$\sum_{n=1}^{\infty} \left(\frac{n^{5/2}}{n^4 + 3n^3} \right)$$

(c) Find the area bounded by the curve
 $xy^2 = 4a^2(2a - x)$ and its asymptote.

5

(d) Find the perimeter of the circle
 $x^2 + y^2 = a^2$.

5

2. (a) Form the differential equations :

4×2=8

(i) $y = ae^{3x} + be^x$

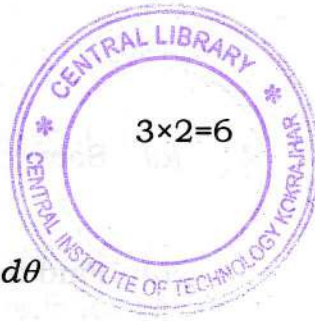
(ii) $y = e^x(A \cos x + B \sin x)$

(b) Test the absolute convergency of the series

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n \left(n^{\frac{1}{3}} + 1 \right)}$$

6





(c) Evaluate :

(i) $\int_0^{\frac{\pi}{6}} \cos^4(3\theta) \sin^3(6\theta) d\theta$

(ii) $\int_0^{\pi} \sin^4\left(\frac{\theta}{2}\right) \cos^3\left(\frac{\theta}{2}\right) d\theta$

3. (a) Solve the following differential equations: $4 \times 3 = 12$

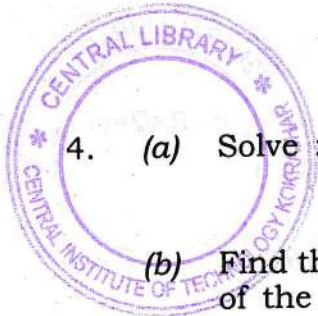
(i) $\frac{dy}{dx} = \frac{3xy + y^2}{3x^2}$

(ii) $(x + y - 10) dx + (x - y - 2) dy = 0$

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

(b) State Cauchy's root test. Using it discuss the convergency of the following: $2 + 6 = 8$

$$\frac{2}{1^2} + \frac{3^2}{2^3} + \frac{4^3}{3^4} + \dots \text{ to } \infty.$$



4. (a) Solve : $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = \sinh(x)$ 5

(b) Find the maximum and minimum value of the function,

$$f(x, y) = x^3 + y^3 - 3x - 12y + 20. \quad 6$$

(c) If $y = \tan^{-1}(x)$, show that

$$(1 + x^2) y_{n+2} + [2(n+1)x - 1] y_{n+1} + n(n+1) y_n = 0. \quad 4$$

(d) Find the equation of the sphere passing through the points $(0, 0, 0)$, $(1, -1, 0)$, $(2, 0, -2)$ and $(0, 1, -2)$. 5

5. (a) Solve the following simultaneous equations : 5

$$\frac{dx}{dt} + 2x - 3y = 0$$

$$\frac{dy}{dt} - 3x + 2y = 0$$

(b) Find the equation of the plane through the line $\frac{x-3}{5} = \frac{y+2}{-3} = \frac{z}{2}$ parallel to the

line $\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z+4}{3}$. 6

(c) Expand $\log(\sin x)$ in power of $(x-3)$.
3

(d) Find all the asymptotes of the curve
 $x^3 + 3x^2y - 4y^3 - x + y + 3 = 0$. 6

6. (a) Show that the equation of the plane through the point (α, β, γ) parallel to the plane $ax + by + cz + d = 0$ is $a(x-\alpha) + b(y-\beta) + c(z-\gamma) = 0$.
6

(b) If 1, 2, 3 are the direction ratios of a line through the origin, find the co-ordinates of a point on the line at a distance 5 from the origin. 4

(c) Find the radius of curvature of the curve $x^3 + y^3 = 3axy$ at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$. 5

(d) Use Taylor's series expansion to compute the value of $\cos 32^\circ$, correct to four decimal places. 5



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53 (HU 101) CMSK

2021

COMMUNICATION SKILLS

Paper : HU 101

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer all questions.

1. (a) Identify the parts of speech of the following words : $1 \times 10 = 10$
naughty, congratulate, step, paper, boxing, arrangement, skills, preparation, original, sky.
- (b) Identify the stem, prefix and suffix of the following words : $2 \times 5 = 10$
 - (i) miscommunication
 - (ii) uncontrolled

Contd.

- (c) Write in brief about Simple sentence, Complex sentence and Compound sentence. 10
3. (a) What is the difference between hearing and listening? Explain the importance of listening skills. 10
- (b) What is a CV? Write about the qualities of an effective CV. 10
4. (a) Write antonyms of the following words : 1×5=5
- (i) light
 - (ii) guilty
 - (iii) polite
 - (iv) precious
 - (v) presence
- (b) Write a synonym of each of the following words : 1×5=5
- (i) beautiful
 - (ii) tasty
 - (iii) original
 - (iv) build
 - (v) organize



(c) Write a paragraph on Effective Communication Skills. 10

5. Write short notes on : **(any four)** 5×4=20

(a) Phrasal verb

(b) Punctuation marks

(c) Google

(d) Social media

(e) Cover letter.

