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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 : 2×2=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 asymtote. 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 : 3×2=6

(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 : 4×3=12

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

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

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

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

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

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,

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

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

$$(1 + x^2) y_{n+2} + [2(n+1)x - 1] y_{n+1} + n(n+1) y_n = 0.$$ 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 asymtotes 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 $cos\,32°$, 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 : 1×10=10

naughty, congratulate, step, paper, boxing, arrangement, skills, preparation, original, sky.

(b) Identify the stem, prefix and suffix of the following words : 2×5=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.