



Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back Exam-2079, Bhadra/Ashwin

Program: Diploma Civil /Computer/Electronics
/Architecture/IT/ Hydropower/Engg.

Full Marks: 80

Year/Part: II/I (2013, 2018, 2014, 2016, 2017)

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Pass Marks: 32

Subject: Engineering Mathematics III

Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

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Group'A'

Attempt All questions.

[3×(5+5)=30]

1. a) Using definition, find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ when

$$f(x, y) = x^3 + y^3 + 3axy$$

- b) Find $\frac{du}{dx}$ of $u = e^{xyz}$, $x = t^3$, $y = \frac{1}{t}$, $z = e^t$.

2. a) Define Group. Prove that the identity element of group is unique. Also show that the inverse of group is unique.

- b) If $G = \{\dots\dots, -6, -4, -2, 0, 2, 4, 6 \dots\dots\}$ then prove that $(G, +)$ is a group.

3. a) Test whether the following series is absolutely or conditionally convergent:

$$1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{4}} + \dots\dots$$

- b) Find the Taylor's series expansion of $f(x) = e^{-x}$ about $x = 2$.

Group'B'

Attempt All questions.

[10×5=50]

4. Solve by separating the variables :

a) $e^{x-y} dx + e^{y-x} dy = 0$ b) $\frac{dy}{dx} = -\frac{1+\cos 2y}{1-\cos 2x}$

5. Solve the homogeneous differential equation : $\frac{dy}{dx} = \frac{x^2 y}{x^3 + y^3}$.

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6. Find the Fourier series expansion of $f(x) = \begin{cases} 0 & -\pi < x < 0 \\ 1 & 0 \leq x < \pi \end{cases}$.

7. Define periodic function. Find the smallest positive period of P of $\sin nx$.

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8. Prepare Cayley table for the set $\{0,1,2,3,4,5\}$ under the operation Multiplication module 6. Identify the identity element and the inverse of each element if possible.

9. Solve the partial differential equation : (Any One)

i) $\frac{\partial f}{\partial x} xz + yz \frac{\partial f}{\partial y} = xy.$ ii) $x p - yq + x^2 - y^2 = 0$

10. Find the interval and radius of convergence of the series :

$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n^2}$$

11. Verify Euler's theorem for homogeneous function

$$f(x, y, z) = x^2 + y^2 + z^2.$$

12. Define convergent and divergent series. Determine whether the following series is convergent or divergent by ratio test

$$\frac{1}{2}x^2 + \frac{2}{3}x^3 + \frac{3}{4}x^4 + \dots\dots$$

13. Test whether the function is even or odd. Find the corresponding Fourier series

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$$f(x) = \begin{cases} \pi, & -1 < x < 0 \\ -\pi, & 0 \leq x < 1 \end{cases}$$

Good Luck!

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