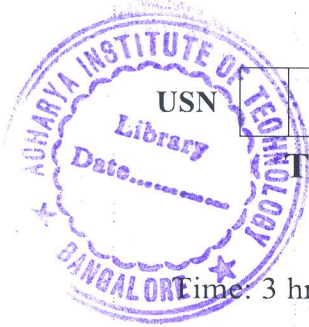


CBCS SCHEME

17MATDIP31



Third Semester B.E. Degree Examination, Dec.2019/Jan.2020

Additional Mathematics – I

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Find the modulus and amplitude of $\frac{3+i}{2+i}$ (07 Marks)
- b. If $x = \cos\theta + i \sin\theta$, then show that $\frac{x^{2n} - 1}{x^{2n} + 1} = i \tan n\theta$. (07 Marks)
- c. Simplify $\frac{(\cos 3\theta + i \sin 3\theta)^4 (\cos 4\theta + i \sin 4\theta)^5}{(\cos 4\theta + i \sin 4\theta)^3 (\cos 5\theta + i \sin 5\theta)^{-4}}$ (06 Marks)

OR

- 2 a. Find the sine of the angle between $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$. (07 Marks)
- b. Find the value of λ , so that the vectors $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 3\hat{k}$ and $\vec{c} = \hat{i} + \lambda\hat{k}$ are coplanar. (07 Marks)
- c. Prove that $\vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) = 0$. (06 Marks)

Module-2

- 3 a. Find the n^{th} derivative of $e^{ax} \cos(bx + c)$. (07 Marks)
- b. If $y = a \cos(\log x) + b \sin(\log x)$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. (07 Marks)
- c. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$. (06 Marks)

OR

- 4 a. Find the pedal equation of $r^n = a^n \cos n\theta$. (07 Marks)
- b. Expand $\log_e(1+x)$ in ascending powers of x as far as the term containing x^4 . (07 Marks)
- c. If $x = r \cos\theta$, $y = r \sin\theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$ (06 Marks)

Module-3

- 5 a. Evaluate $\int_0^1 \int_{y^2}^y (1+xy^2) dx dy$ (07 Marks)
- b. Evaluate $\int_0^{2\pi} \sin^4 x \cos^6 x dx$ (07 Marks)
- c. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}} dx$ (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Evaluate $\int_1^2 \int_3^4 (xy + e^y) dy dx$ (07 Marks)
- b. Evaluate $\int_0^\pi x \sin^8 x dx$ (07 Marks)
- c. Evaluate $\int_1^2 \int_0^1 \int_{-1}^1 (x^2 + y^2 + z^2) dx dy dz$ (06 Marks)

Module-4

- 7 a. If particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$ where t is the time. Find the velocity and acceleration at $t = 1$. (07 Marks)
- b. Find the angle between the tangents to the curve $\vec{r} = t^2 \hat{i} + 2t \hat{j} - t^3 \hat{k}$ at the point $t = \pm 1$. (07 Marks)
- c. If $\vec{F} = (3x^2y - z)\hat{i} + (xz^3 + y^4)\hat{j} - 2x^3z^2\hat{k}$ find $\text{grad}(\text{div } \vec{F})$ at $(2, -1, 0)$. (06 Marks)

OR

- 8 a. Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$ along $2\hat{i} - 3\hat{j} + 6\hat{k}$ (07 Marks)
- b. Find the unit normal to the surface $x^2y + 2xz = 4$ at $(2, -2, 3)$. (07 Marks)
- c. Show that $\vec{F} = (2xy^2 + yz)\hat{i} + (2x^2y + xz + 2yz^2)\hat{j} + (2y^2z + xy)\hat{k}$ is irrotational. (06 Marks)

Module-5

- 9 a. Solve $\frac{dy}{dx} = \sin(x + y)$ (07 Marks)
- b. Solve $\frac{dy}{dx} + y \cot x = \cos x$ (07 Marks)
- c. Solve $(x - y + 1)dy - (x + y - 1)dx = 0$ (06 Marks)

OR

- 10 a. Solve $(1 + e^{x/4})dx + e^{x/y} \left(1 - \frac{x}{y}\right)dy = 0$. (07 Marks)
- b. Solve $(x^3 \cos^2 y - x \sin 2y) dx = dy$. (07 Marks)
- c. Solve $(3x^2y^4 + 2xy)dx + (2x^3y^3 - x^2)dy = 0$ (06 Marks)
