Question Paper

Exam Date & Time: 13-Nov-2019 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATIONS
NOVEMBER-2019
I SEMESTER B.Sc. (Applied Sciences) in Engg.
MATHEMATICS - 1 [IMA 111]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1) If $y = e^{msin^{-1}x}$ prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0.$ (3)

A)

B) Find the nth derivative of $(i)\ y = e^{2x}cos^2x\ sinx$ (ii) $\frac{x+3}{(x-1)(x+2)}$ (4)

C) Derive the expression for angle between the radius vector and tangent. (3)

2) Expand $log(1+e^x)$ by Maclaurin's series up to the term containing x^4. (3)

A)

B) Evaluate $(i)\lim_{x\to 1}\frac{x^x-x}{x-1-logx}$ $(ii)\lim_{x\to 0}(cotx)^{1/logx}$. (4)

C) Verify Cauchy's mean-value theorem for the function e^x and e^{-x} in the interval (a,b). (3)

3) A) Discuss the convergence of the series, (a) $\frac{1}{2\sqrt{1}} + \frac{x^2}{3\sqrt{2}} + \frac{x^4}{4\sqrt{3}} + \frac{x^6}{5\sqrt{4}} + \cdots$ (b) $\sum_{n=1}^{\infty}\frac{n!}{(n^n)^2}$ (4)

B) Find the equation of the plane through the points $(2,2,1)$ and $(1,1,2)$ and perpendicular to the plane $2x+6y+6z=9$. (3)

C) The radius of a normal section of a right circular cylinder is 2 units, the axis lies along the straight line $\frac{x-1}{2} = \frac{y+3}{-1} = \frac{z-2}{5}$. Find the equation of the right circular cylinder (3)

4) A) Obtain a reduction formula for $\int_0^{\pi/2}\cos x\,dx$. when n is a non-negative integer and evaluate $\int_0^3\sqrt{\frac{x^3}{3-x}}dx$. (4)

B) Trace the curve $y^2(a-x) = x^3,\ a>0$ with explanation. (3)

C) Find the missing term from the following table. (3)

x	0	1	2	3	4	5
f(x)	1	2	4	8	----	32

5) (3)

A) Find the perimeter of the curve $x^{2/3} + y^{2/3} = a^{2/3},\ a > 0$

B) (4)

Find the distance of the point $(1, -2,\ 3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-3}$.

C) (3)

Find the volume of the solid obtained by revolving one arc of the cycloid $x = a(\theta + sin\theta)$, $y = a(1 + cos\theta),\ a > 0$ about the x-axis.

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