Question Paper

Exam Date & Time: 26-Dec-2019 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - NOVEMBER 2019
I SEMESTER B.Sc.(Applied Sciences) In Engg.
MATHEMATICS-I [IMA 111 - S2]

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

Answer all the questions.

1) (3)

If $y = cos\ (msin^{-1}x)$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2-n^2)y_n = 0$.

A)

B) (3)

Find the angle of intersection of the curves $r = sin\,\theta + cos\,\theta, r = 2\,sin\,\theta$

C) (4)

Evaluate the following: $(i)\ \lim_{x\to 0}\left[\frac{1}{x} - \frac{1}{e^x-1}\right]$ $(ii)\ \lim_{x\to 0}\left(\frac{tanx-x}{x^2tanx}\right)$

2) (4)

A) Find the nth derivatives of: $(a)\ e^{2x}cosx\ sin^2 2x$ $(b)\frac{x^2}{(x+2)(x+3)}$

B) (3)

Find the first three non-zero terms in the Maclaurin's series expansion of $y = \log(1+x)$.

C) (3)

Derive the expression for the centre of curvature at any point $P(x,y)$ on the curve $y = f(x)$.

3) (3)

A) Show that the P-series $\sum_{n=1}^{\infty}\frac{1}{n^p} = \frac{1}{1^p} + \frac{1}{2^p} + \frac{1}{3^p} + \cdots \ldots \ldots \ldots \infty$

a) converges for $p > 1$ and b) diverges for $p \le 1$.

B) (4)

Evaluate $(a)\ \int_0^{\frac{\pi}{2}} sin^2x\ cos^6x\ dx$, $(b)\ \int_0^2 x^{5/2}\sqrt{2-x}\,dx$

C) (3)

Find the angle between two diagonals of a cube.

4) (4)

A)

Find the distance of the point $A(3,-4,5)$ from the plane $2x + 5y - 6z = 16$, measured parallel to the line $\frac{x}{2} = \frac{y}{1} = \frac{z}{-2}$.

B) (3)

Trace the following curve with explanations: $x^{2/3} + y^{2/3} = a^{2/3}$, a > 0.

C) (3)

Find the entire length of the cardioid $r = a(1-cos\theta)$, a > 0 .

5) (4)

3) (4)

A) Find the volume of the solid formed by revolving the curve $x = a(\theta - sin\theta),\ y = a(1 - cos\theta)$ a>0 about its base.

B) Find the equation of the right circular cone whose vertex is at the origin and semi vertical angle is α and having axis of Z-axis as its axis (3)

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

x	0	1	2	3	4	5
f(x)	1	3	9	27	----	243

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