In the curve , prove that the co-ordinates of the centre

of curvature are given by .

ZàÎÀà-3. $\int \left[\sqrt{\tan x} + \sqrt{\cot x} \right] dx$ §ýà tàÂà Öààm §ýLâk¥ ñ

Find the value of $\int \left[\sqrt{\tan x} + \sqrt{\cot x} \right] dx$.

OR

qÊwvuà $y^2 = 4ax$ ¡àÊ $x^2 = 4ay$ §ý rãj £suâÂà™ ÕàØàÄýv §ýà Öààm §ýLâk¥ ñ

Find the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

ZàÎÀà-4. Ñv §ýLâk¥ (Solve) ß

$$\left(D^2 - 4D + 4\right) y = e^x + x^2 + \cos 2x$$

OR

Ñv §ýLâk¥ (Solve) ß

$$xdy - ydx = \sqrt{x^2 + y^2}\, dx$$

ZàÎÀà-5. Zààjv âwjÊ½à §ýL âwâo §ýà Zàuàªà §ýÊ§ý Ñv §ýLâk¥ ß

Apply the method of variation of parameters to solve :

$$\left(D^2 + 1\right) y = x$$

OR

âÂàÈÀà uªàqm ytã§ýÊ½ààì §ýà Ñv §ýLâk¥ ß

Solve the following simultaneous differential equations :

----x----

Roll No......................

Total No. of Section : 03
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Code No. : B-209(B)

Annual Examination - 2017

B.Sc.-I

MATHEMATICS

Paper - II

CALCULUS

Max.Marks : 50

Time : 3 Hrs. **Min Marks : 17**

¹âq ß h½»¦ '¡' t¦ Ày ¡âmv i¦ÙàÊã ZàÎÀà Ñ¦, âkÂÑ¦ Ñv §ýÊÀàà ¡âÂàwàu Ñ¦ ñ h½»¦ 'r' t¦ v i¦ÙàÊã ZàÎÀà h½»¦ 'y' t¦ Àãi¦ £ÙàÊãu ZàÎÀà Ñ¦ ñ h½»¦ '¡' §ýà yry qÑv¦ Ñv §ýÊ¦ ñ

Note: Section 'A' , containing 10 very short answer type questions, is compulsory. Section 'B' consists of short answer type questions and Section 'C' consists of long answer type questions. Section 'A' has to be solved first.

h½»¦-'¡'(Section-'A')

âÂàÈÀàà¦â§ým ¡âm v i¦£ÙàÊãu ZàÎÀàà¦ §ý £ÙàÊ Àãâk¥ ñ (Answer the following very short-answer-type questions) (1x10=10)

ZàÎÀà-1. ÄývÂà $f(x) = x \sin \frac{1}{x}$ §ý âv¥ $f(0+0)$ Öààm §ýLâk¥ ñ

For the function , find $f(0+0)$

ZàÎÀà-2. ÄývÂà §ýà ZàyàÊ âvâh¥ ñ

Write the expansion of function $\tan^{-1} x$.

ZàÎÀà-3. ÀÎàà¢u¦ â§ý w§ý $y = e^x$ ywØà £qáÊt¦hã ¡wmv Ñ¦ ñ

Show that the curve is concave upwards every where.

ZàÎÂà-4. oïwàÂmÊ Êhà qÊ vÈr w§ýmà kãwà §ýà yØà âvâh¥ ñ

Write the formula of chord of curvature perpendicular to the radius vector.

ZàÎÂà-5. §ýà tàÂà Öààm §ýLâk¥ ñ

Find the value of .

ZàÎÂà-6. §ýà tàÂà Öààm §ýLâk¥ ñ

Find the value of $\int_0^{\pi/2} \sin^4 x \cos^2 x dx$.

ZàÎÂà-7. ¡w§ýv ytã§ýÊ½à $\frac{d^2x}{dy^2}+\sqrt{\left[1+\left(\frac{dx}{dy}\right)^2\right]}=0$ §ýL §ýàâ¹¦ ¡àÊ iàm Öààm §ýLâk¥ ñ

Find the order and degree of the differential equation $\frac{d^2x}{dy^2}+\sqrt{\left[1+\left(\frac{dx}{dy}\right)^2\right]}=0$.

ZàÎÂà-8. ¡w§ýv ytã§ýÊ½à $\frac{dy}{dx}=\frac{-\cos y}{y^2-x\sin y}$ §ý unàwm ÑàÂà¦ §ýà qÊãÕà½à §ýLâk¥ ñ

Examine the differential equation $\frac{dy}{dx}=\frac{-\cos y}{y^2-x\sin y}$ for exactness.

ZàÎÂà-9. ¡w§ýv ytã§ýÊ½à $x^2\frac{d^2y}{dx^2}-2\left(x^2+x\right)\frac{dy}{dx}+\left(x^2+2x+2\right)y=0$ §ý âv¥ §ýà tàÂà Öààm §ýLâk¥ ñ

Find the value of of the differential equation .

OR

Ñv §ýLâk¥ (Solve) ß

h½»|-'y' (Section-'C')

âÂàÈÂààâ§ým Àãi¦ £ÙàÊãu ZàÎÂàà¦ §ý £ÙàÊ Ààâk¥ ñ (Answer the following long-answer type questions) **(5x5=25)**

ZàÎÂà-1. ¹¦vÊ §ý Zàt¦u y¦ $\log_e \sin x$ §ýà §ýL iàmà¦ t¦ ZàyàÊ §ýLâk¥ ñ

Expand in powers of by Taylor's theorem.

OR

uâÀ , mà¦ ây÷ §ýLâk¥ â§ý $\left(1-x^2\right)y_2-xy_1=2$ mnà .

[illegible]

If , then prove that $\left(1-x^2\right)y_2-xy_1=2$ and .

ZàÎÂà-2. w§ý §ýL ¡ÂàmÐqâÎà¦uà¦ Öààm §ýLâk¥ ñ

Find the asymptotes of the curve

OR

ây÷ §ýLâk¥ â§ý w§ý §ý âv¥ w§ýmà §ýÂô §ý âÂàÀ¦Îàà¦§ý

Ñ¦ ñ

ZàÎÂà-10. ytä§ÿÊ½à §ÿL ³uààtmãu Íuà©uà âvâh¥ ñ

Write geometrical interpretation of the differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$.

h½»|-'r' (Section-'B')

âÂàÈÂààlâ§ÿm vii £ÙàÊãu ZàÎÂààµ §ÿ £ÙàÊ Àââk¥ ñ (Answer the following short-answer type questions) **(3x5=15)**

ZàÎÂà-1. $\in-\delta$ m§ÿÂàä§ÿ §ÿ Zàuàªà y¦ y¾uààqm §ÿLâk¥ :

Using technique, verify that .

OR

ây÷ §ÿLâk¥ â§ÿ qÊ Äÿvâà ymm¦ Ñ¦ ñ

Prove that the following function is continuous at ,

ZàÎÂà-2. úÀuàs §ÿ â§ÿyã ârÂÀ¦ (r,θ) qÊ w§ÿmà âØà³uà Öààm §ÿLâk¥ ñ

Find the radius of curvature at any point of the cardioid

.

OR

w§ÿ $y^2(2a-x)=x^3$ §ÿà ¡ÂàÊ¦h½à §ÿLâk¥ ñ

Trace the curve .

(3) **Code No. : B-209(B)**

ZàÎÂà-10. ytä§ÿÊ½à $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ §ÿL ³uààtmãu Íuà©uà âvâh¥ ñ

Write geometrical interpretation of the differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$.

h½»|-'r' (Section-'B')

âÂàÈÂààlâ§ÿm vii £ÙàÊãu ZàÎÂààµ §ÿ £ÙàÊ Àââk¥ ñ (Answer the following short-answer type questions) (3x5=15)

ZàÎÂà-1. $\in-\delta$ m§ÿÂàä§ÿ §ÿ Zàuàªà y¦ y¾uààqm §ÿLâk¥ :

Using technique, verify that .

OR

ây÷ §ÿLâk¥ â§ÿ qÊ Äÿvâà ymm¦ Ñ¦ ñ

Prove that the following function is continuous at ,

ZàÎÂà-2. úÀuàs §ÿ â§ÿyã ârÂÀ¦ (r,θ) qÊ w§ÿmà âØà³uà Öààm §ÿLâk¥ ñ

Find the radius of curvature at any point of the cardioid

.

OR

w§ÿ $y^2(2a-x)=x^3$ §ÿà ¡ÂàÊ¦h½à §ÿLâk¥ ñ

Trace the curve .

P.T.O.

ZàÎÂà-3. §ýà tàÂà Öààm §ýLâk¥ ñ

Evaluate $\int \frac{dx}{4+5\cos x}$.

OR

ây÷ §ýLâk¥ â§ý $\int_0^1 x^2 \left(1-x^2\right)^{3/2} dx = \frac{\pi}{32}$

Prove that $\int_0^1 x^2 \left(1-x^2\right)^{3/2} dx = \frac{\pi}{32}$.

ZàÎÂà-4. w§ý §ýv $r^n \sin n\theta = a^n$ §ýà vr§ýà½ààu y²Àã Öààm §ýLâk¥, kÑà w§ý §ýv §ýà Zààjv Ñ ñ

Find the orthogonal trajectories of given family of curves
a, being parameter of family of curve.

OR

¡w§ýv ytâ§ýÊ½à §ýà Ñv §ýLâk¥ ñ

Solve the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$.

ZàÎÂà-5. ¡w§ýv ytâ§ýÊ½à $\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + \left(4x^2-3\right)y = e^{x^2}$ §ýà qÊ§ý ÄývÂà Öààm §ýLâk¥ ñ

Find the complimentary function of the differential equation
$\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + \left(4x^2-3\right)y = e^{x^2}$.

(4) **Code No. : B-209(B)**

ZàÎÂà-3. $\int \frac{dx}{4+5\cos x}$ §ýà tàÂà Öààm §ýLâk¥ ñ

Evaluate $\int \frac{dx}{4+5\cos x}$.

OR

ây÷ §ýLâk¥ â§ý $\int_0^1 x^2 \left(1-x^2\right)^{3/2} dx = \frac{\pi}{32}$

Prove that $\int_0^1 x^2 \left(1-x^2\right)^{3/2} dx = \frac{\pi}{32}$.

ZàÎÂà-4. w§ý §ýv $r^n \sin n\theta = a^n$ §ýà vr§ýà½ààu y²Àã Öààm §ýLâk¥, kÑà w§ý §ýv §ýà Zààjv Ñ ñ

Find the orthogonal trajectories of given family of curves
a, being parameter of family of curve.

OR

¡w§ýv ytâ§ýÊ½à §ýà Ñv §ýLâk¥ ñ

Solve the differential equation $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$.

ZàÎÂà-5. ¡w§ýv ytâ§ýÊ½à $\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + \left(4x^2-3\right)y = e^{x^2}$ §ýà qÊ§ý ÄývÂà Öààm §ýLâk¥ ñ

Find the complimentary function of the differential equation
$\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + \left(4x^2-3\right)y = e^{x^2}$.