ZàÎÀà-4. ây÷ §ýLâk¥ (Prove that) :

**OR**

uâÀ $P_n$ iàm §ýà ¥§ý v¦kàÅ»¦ rÑqÀ Ñ¦, mà¦ âÅàÈÂàâvâhm y¦ro §ýà ây÷ §ýLâk¥ ß

If is a Legendre's polynomial of degree , then prove that relation :

ZàÎÀà-5. qáÊyãtà Zàâmr¦oà¦ $y(0)=0,\ y(\pi)=1$ mnà ÍuwÊà¦o §ý ¡oãÅà

Äýv Âà§ý $I=\int_0^{\pi}\left[(y')^2-y^2\right]dx$ §ýà jÊt tàÅà Öààm §ýLâk¥ ñ

Find the extremal of the functional $I=\int_0^{\pi}\left[(y')^2-y^2\right]dx$ under the conditions $y(0)=0,\ y(\pi)=1$ and subject to constraint

**OR**

Àãi¦wÙà $4x^2+9y^2=36$ ¥w¦ ârÂÀ¦ §ý tÁu v¦iÙàt ÀÊã Öààm §ýLâk¥ ñ

Find the shortest distance between the ellipse $4x^2+9y^2=36$ and the point .

----x----

Roll No..... Total No. of Section : 03

Total No. of Printed Pages : 06

**Code No. : B-241(B)**

**Annual Examination - 2017**

**B.Sc.-II**

**MATHEMATICS**

**Paper - II**

**DIFFERENTIAL EQUATIONS**

**Max.Marks : 50**

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

¹¦ãq ß h½»¦'¡' t¦Ày ¡âmv¦iÙàÊã ZàÎÀà Ñ¦, âkÂÑ¦ Ñv §ýÊÂàà ¡âÀàwàu¦ Ñ¦ ñ h½»¦'r' t¦ v¦iÙàÊã ZàÎÀà h½»¦'y' t¦ Àã¡i¦ £Ùà Êãu ZàÎÀà Ñ¦ ñ h½»¦'¡' §ýà yry¦ qÑv¦ Ñv §ýÊ¦ ñ

Note : Section 'A' containing 10 very short 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')**

**âÅàÈÂàà¡à§ým ¡âm v¦i£ÙàÊãu ZàÎÀàà¦ §ý £ÙàÊ Àãåk¥ ñ (Answer the following very short-answer-type questions.) (1x10=10)**

ZàÎÀà-1. Äýv Âà $F(t)=1$ §ýà vàÁvày Ûýqàm Ê Öààm §ýLâk¥ ñ

Find the Laplace transform of the function .

ZàÎÀà-2. Äýv Âà §ýà vàÁvày Ûýqàm Ê Öààm §ýLâk¥ ñ

Find the Laplace transform of the function $F(t)=\sin t\,\cos t$ .

ZàÎÀà-3. âÅàÈÂà t¦ y¦ $a$ ¡àÊ §ýà âwvàqÂà §ýÊ§ý ¡àâÎà§ý ¡w§ýv ytã§ýÊ½à §ýà âÂàtà½à §ýLâk¥ ß

Find the partial different equation by the elimination of a and b from :

$z = ax + by + ab$

ZàÎÀà-4. ytâ§ýÊ½à §ýà q½à ytà§ýv Öààm §ýLâk¥ ñ

Find the complete integral of the equation $p^2 + q^2 = m^2$.

ZàÎÀà-5. âÂàÈÀàà â§ým ¡w§ýv ytâ§ýÊ½à §ýà wªà J§ýÊ½à §ýLâk¥ ß

Classify the following differential equation :

$$\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x\,\partial y} + 3\frac{\partial^2 z}{\partial y^2} = 0$$

ZàÎÀà-6. Ñv §ýLâk¥ (Solve) ß

$$r = a^2 t$$

ZàÎÀà-7. $J_n$ ¡àÊ §ýà Êàyâ§ýuÂà yØà âvâh¥ ñ

To write the Wronskian formula of and .

ZàÎÀà-8. v¡kàÂ»¦ §ýà ¡w§ýv ytâ§ýÊ½à Öààm §ýLâk¥ ñ

Find out Legendre's differential equation.

ZàÎÀà-9. uâÀ wªà qÊ ¥§ý ÄývÂà§ý $I\left[y(x)\right] = \int_0^1 y(x)\,dx$ qáÊsàâxm Ñ¡ mà¡,

$I[1]$ §ýà tàÂà Öààm §ýLâk¥ ñ

If a functional is defined on the class $C[0,1]$,

then find the value of $I[1]$.

ZàÎÀà-10. §ýÂôâu Õà¡Øà §ýà¡ qáÊsàâxm §ýLâk¥ ñ

Define central field.



## h½»¦-'y' (Section-'C')

**âÂàÈÀàà â§ým Àã i¦ £ÙàÊâu ZàÎÀà à¦ §ý £ÙàÊ Àââk¥ ñ (Answer the following long-answer type questions.)** **(5x5=25)**

ZàÎÀà-1. §ýà tàÂà Öààm §ýLâk¥ ñ

Find the value of $L\{\sin at - at\cos at\}$.

**OR**

ytâ§ýv ytâ§ýÊ½à $y(t) = t^2 + \int_0^t y(u)\sin(t-u)\,du$ §ýà Ñv §ýLâk¥ ñ

Solve the integral equation $y(t) = t^2 + \int_0^t y(u)\sin(t-u)\,du$.

ZàÎÀà-2. Ñv §ýLâk¥ (Solve) ß

$[y(x)] = \int_0^{2\pi} y(x)\,dx$ $p + q = x + y + z$

**OR**

jàÊâq¹¦ âwâo y¡ Ñv §ýLâk¥ (Solve by Charpit's method) ß

ZàÎÀà-3. Ñv §ýLâk¥ (Solve) ß

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = x - y$$

**OR**

Ñv §ýLâk¥ (Solve) ß

$$x^2\,\frac{\partial^2 z}{\partial x^2} - y^2\,\frac{\partial^2 z}{\partial y^2} = xy$$

## h½»-'r' (Section-'B')

**âÀèÀàà¤§ým vi¦ £ÙàÊãu ZàÎÀàà¤ §ý £ÙàÊ Àãák¥ ñ (Answer the following short-answer type questions.) (3x5=15)**

ZàÎÀà-1. Äýv Â à $F(t)$ §ýà vàÄvày Ûýq àmÊ Öàà m §ýLâk¥, kÑà

Find the Lapalce transform of the function $F(t)$, where

**OR**

À Îà à¢u¦ â§ý $L\{t^n e^{at}\} = \frac{\lfloor n}{(p-a)n+1}$ ; $p > a$.

Show that $L\{t^n e^{at}\} = \frac{\lfloor n}{(p-a)n+1}$ ; $p > a$.

ZàÎÀà-2. Ñv §ýLâk¥ (Solve) ß

$$x z\, p + y z\, q = xy$$

**OR**

q½à Ñv Öàà m §ýLâk¥ (Find the complete integral) ß

ZàÎÀà-3. Ñv §ýLâk¥ (Solve) ß



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h½»-'r' (Section-'B')

âÀèÀàà¤§ým vi¦ £ÙàÊãu ZàÎÀàà¤ §ý £ÙàÊ Àãák¥ ñ (Answer the following short-answer type questions.) (3x5=15)

ZàÎÀà-1. Äýv Â à $F(t)$ §ýà vàÄvày Ûýq àmÊ Öàà m §ýLâk¥, kÑà

Find the Lapalce transform of the function $F(t)$, where

**OR**

À Îà à¢u¦ â§ý $L\{t^n e^{at}\} = \frac{\lfloor n}{(p-a)n+1}$ ; $p > a$.

$pq = xy$

$\frac{\partial^2 z}{\partial x^2} = a^2 \frac{\partial^2 z}{\partial y^2}$

$F(t) = \begin{cases} 4, & 0 < t \le 1 \\ 3t, & t > 1 \end{cases}$

Show that $L\{t^n e^{at}\} = \frac{\lfloor n}{(p-a)n+1}$ ; $p > a$.

ZàÎÀà-2. Ñv §ýLâk¥ (Solve) ß

$$x z\, p + y z\, q = xy$$

**OR**

q½à Ñv Öàà m §ýLâk¥ (Find the complete integral) ß

ZàÎÀà-3. Ñv §ýLâk¥ (Solve) ß

P.T.O.

**OR**

Ñv §ýLâk¥ (Solve) ß

$$\left(D^2-6DD'+9D'^2\right)z=6x+2y$$

ZàÎÀà-4. ây÷ §ýLâk¥ (Prove that) ß

$$\frac{d}{dx}\left(x^n J_n(x)\right)=x^n J_{n-1}(x)$$

**OR**

ây÷ §ýLâk¥ (Prove that) ß

$$P_n(-x)=(-1)^n P_n(x)$$

ZàÎÀà-5. ¡ÂmÊàv $[0,1]$ t¡ wSýà ¥w §ý rãj §ýL ÀÊã Öààm §ýLâk¥ ñ

Find the distance between the curves and in the interval of .

**OR**

Äýv Âà§ý , $y(1)=1$, $y(e)=1$ §ý jÊt tàÂà §ýà qÊâÕà½à §ýLâk¥ ñ

Test for the extremum of the functional , $y(1)=1$, $y(e)=1$.

(4) Code No. : B-241(B)

**OR**

Ñv §ýLâk¥ (Solve) ß

ZàÎÀà-4. ây÷ §ýLâk¥ (Prove that) ß

$$\frac{d}{dx}\left(x^n J_n(x)\right)=x^n J_{n-1}(x)$$

**OR**

ây÷ §ýLâk¥ (Prove that) ß

$$P_n(-x)=(-1)^n P_n(x)$$

ZàÎÀà-5. ¡ÂmÊàv $[0,1]$ t¡ wSýà ¥w §ý rãj §ýL ÀÊã Öààm §ýLâk¥ ñ

Find the distance between the curves and in the interval of .

**OR**

Äýv Âà§ý , $y(1)=1$, $y(e)=1$ §ý jÊt tàÂà §ýà qÊâÕà½à §ýLâk¥ ñ

Test for the extremum of the functional , $y(1)=1$, $y(e)=1$.