USN

06MAT21

Second Semester B.E. Degree Examination, June–July 2009
Engineering Mathematics - II

Time: 3 hrs.

Max. Marks:100

Note : 1. *Answer any Five full question, choosing at least two from each part.*
2. *Answer all objectives type questions only in OMR sheet page 5 of the Answer Booklet.*
3. *Answer to the objective type questions on sheets other than OMR will not be valued*

PART – A

1 a. Select correct answer in each of the following :

i) Curvature of a circle is
A) a constant B) a variable C) a straight line D) none of these.

ii) Radius of curvarture for the Cartesian curve y = f(x) is
A) $\frac{(1+y_2^2)^{3/2}}{y_2}$ B) $\frac{(1+y_1^2)^{3/2}}{y_2}$ C) $\frac{(1+y_1^2)^3}{y_2}$ D) $\frac{(1+y_1^2)^2}{y_2}$

iii) If f(x) is continuous in the closed interval [a,b] , differentiable in (a,b) and f(a) = f(b) then there exists at least one value c of x in (a,b) such that f ' (c) is equal to
A) 1 B) -1 C) 2 D) 0

iv) Maclaurin's series expansion of e^x is
A) $1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+....$ B) $x-\frac{x^3}{3!}+\frac{x^5}{5!}-.....$
C) $x+\frac{x^3}{3}+\frac{x^5}{5}+.....$ D) $1-\frac{x^2}{2!}+\frac{x^4}{4!}-.....$ **(04 Marks)**

b. Show that the radius of curvature of the curve y = 4 Sin x – Sin 2x at $x=\frac{\pi}{2}$ is $\frac{5\sqrt{5}}{4}$. **(04 Marks)**

c. Verify Lagrange's mean value theorem for the function f(x) = (x-1) (x-2) (x-3) in [0,4]. **(06 Marks)**

d. Expand log(secx) using Maclaurin's series upto the term containing x^4. **(06 Marks)**

2 a. Select correct answer in each of the following :

i) $\underset{x\to 1}{Lt}\ \frac{x^2-4x+3}{x^2-3x+2}$ is equal to
A) 0 B) -2 C) 2 D) -1

ii) f(a,b) is said to be a stationary value of f(x,y) if
A) $f_x(a,b)=0$, $f_y(a,b)\neq 0$ B) $f_x(a,b)=0$, $f_y(a,b)=0$
C) $f_{xx}(a,b)=0$, $f_{yy}(a,b)=0$ D) $f_{xy}(a,b)=0$, $f_{yy}(a,b)=0$.

iii) If $r=f_{xx}(a,b)$, $s=f_{xy}(a,b)$, $t=f_{yy}(a,b)$ then f(x,y) will have a minimum at (a,b) if
A) $f_x=0$, $f_y=0$ $rt-s^2>0$ and $r>0$ B) $f_x=0$, $f_y=0$. $rt-s^2>0$ and $r<0$
C) $f_x=0$, $f_y=0$ $rt-s^2=0$ and $r>0$ D) $f_x=0$, $f_y=0$, $rt-s^2>0$ and $r=0$.

iv) The volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is

A) $\frac{16abc}{3\sqrt{3}}$ B) $\frac{8abc}{3\sqrt{3}}$ C) $\frac{24abc}{3\sqrt{3}}$ D) $\frac{4abc}{3\sqrt{3}}$ **(04 Marks)**

b. Evaluate $\underset{x\to 0}{\text{Lt}} \tan x \log x$. **(04 Marks)**

c. Expand f(x,y) = Sinx cosy in powers of x and y as far as the terms of third degree. **(06 Marks)**

d. The temperature T at any point (x,y,z) in space is $T = 400\, xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2=1$. **(06 Marks)**

3 a. Select correct answer in each of the following : **(04 Marks)**

i) $\int_b^a \int_a^b dxdy =$

A) 0 B) $\frac{ab}{2}$ C) 2ab D) ab.

ii) Volume of a solid is equal to

A) ∭ dx dy dz B) ∬ dx dy C) ∬ xy dx dy D) None of these.

iii) The value of $\int_0^1 x^7(1-x)^8 dx$ is

A) β(7,8) B) β(8,9) C) β(7,9) D) None of these

iv) The value of Γ(n + 1) is

A) (n +1)! B) (n + 1) Γ (n + 1) C) n Γ(n) D) (n - 1) Γ (n -1)

b. Evaluate ∬ xy(x + y) dx dy taken over the region enclosed by the curves y = x and $y = x^2$. **(04 Marks)**

c. Evaluate $\int_0^{\pi/2}\int_0^{(a\sin\theta)}\int_0^{\left(\frac{a^2-r^2}{a}\right)} r\,dr\,d\theta\,dz$. **(06 Marks)**

d. Evaluate $\int_0^{\pi/2}\sqrt{\cot\theta}\,d\theta$ by expressing interms of gamma functions. **(06 Marks)**

4 a. Select correct answer in each of the following :

i) If $\vec{F}$ is irrotational around every closed curve C, then.

A) $\int_c \vec{F}.d\vec{r}=0$ B) $\int_c \vec{F}\times d\vec{r}=0$ C) $\int_c d\vec{r}=0$ D) None of these

ii) If $\vec{F}=x^2 i+xy j$ then the value of $\int \vec{F}.d\vec{r}$ from (0,0) to (1,1) along the line y = x is

A) $\frac{3}{2}$ B) $\frac{2}{3}$ C) 3 D) 2

iii) Green's theorem in the plane is a special case of

A) Gauss theorem B) Euler's theorem C) Stokes theorem D) Baye's theorem.

iv) The spherical coordinate system is

A) Orthogonal B) Coplanar C) Collinear D) Not orthogonal **(04 Marks)**

b. Using Green's theorem in the plane, evaluate $\int\{(2x^2-y^2)dx+(x^2+y^2)dy\}$, where C is the boundary of the region bounded by x = 0, y = 0, x + y = 1. **(04 Marks)**