Printed pages: 2	**AS103/EAS103**
(The paper code and roll No. to be filled in your answer book)	
Roll No.	

B TECH
(SEM I) CARRY OVER EXAMINATION 2016-17
ENGINEERING MATHEMATICS

TIME: 3 Hours **Total Marks: 100**

Note: Attempt all questions. Allquestions carry equal marks.

Q1. Attempt any two parts of the following: **[10x2=20]**

(a) If $Y = sin(m \sin^{-1} x)$, prove that

$$(1-x^2)y_{n-2} - (2n-1)xy_{n+1} - (n^2-m^2)y_n = 0$$

Also find $y_{n/0}$

(b) If $w = \sqrt{x^2+y^2+z^2}$, $x = ucosv$, $y = usinv$ and $z = uv$then prove that

$$u\frac{\partial w}{\partial u} - v\frac{\partial w}{\partial v} = \frac{u}{\sqrt{1+v^2}}$$

(c) Trace the curve $3ay^2 = x(x-a)^2$

Q2. Attempt any two parts of the following: **[10x2=20]**

(a) If $u = x(1-r^2)^{-1/2}$, $v = y(1-r^2)^{-1/2}$, $w = z(1-r^2)^{-1/2}$ the show that $\frac{\partial(uvw)}{\partial(xyz)} = (1-r^2)^{-5/2}$where$r^2 = x^2+y^2+z^2$

(b) Expand $f(xy) = e^x tan^{-1} y$ about point (1,1) up to second degree term.

(c) Find the maximum value of u where $u = sinxsinysin(x+y)$

Q3. Attempt any two parts of the following: **[10x2=20]**

(a) Find the rank of matrix by reducing to echelon form $A = \begin{bmatrix} 1 & a & b & 0 \\ 0 & c & d & 1 \\ 1 & a & b & 0 \\ 0 & c & d & 1 \end{bmatrix}$

(b) For what value of λ the system of equations

$x+y+z=1,$

$x+2y+4z=\lambda,$

$x+4y+10z=\lambda^2$

have a solution and solve them in each case.

(c) Using Caylay's Hamilton theorem, find the inverse of the matrix A^{-1} when

$$A=\begin{bmatrix}1 & 0 & 2\\ 0 & 2 & 1\\ 2 & 0 & 3\end{bmatrix}$$

Q4. Attempt any two parts of the following: [10x2=20]

(a) Evaluate the following gamma function: $\dfrac{\Gamma(n+\frac{1}{2})}{\Gamma(n+1)}$

(b) Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ and hence show that $\int_0^\infty e^{-x^2}dx=\dfrac{\sqrt{\pi}}{2}$

(c) Evaluate the triple integral $\int_0^0\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}}(xyz)dxdydz$.

Q5. Attempt any two parts of the following: [10x2=20]

(a) Show that $curve\left(\dfrac{\vec{a}\times\vec{r}}{r^3}\right)=-\dfrac{\vec{a}}{r^3}+\dfrac{3\vec{r}}{r^5}(\vec{a},\vec{r})$

(b) Verify the Gauss divergence theorem $\int_c\left[\left(x^3-yz\right)\hat{i}-2x^2y\hat{j}+2\hat{k}\right]\hat{n}ds$ where s denotes surface of cube bounded by plane $x=0, x=a; y=0, y=a; z=0, z=a$.

(c) Evaluate the surface integral $\iint_s\left[xdydz+ydzdx+zdxdy\right]$ where s is the portion of the plane $x+2y+3z=6$ which lies in first octant.