Printed Pages : 4

NAG-101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **180119**

Roll No.

B. Tech.

(SEM. I) (ODD SEM.) THEORY EXAMINATION, 2014-15

ENGINEERING MATHEMATICS - I

Time : **3** Hours] [Total Marks : **100**

SECTION – A

1 Attempt all parts of this question. Each part carries two marks : **2×10=20**

(a) Find the derivative of $y = 3x^2 + 4x^3$ with respect to x.

(b) Examine the continuity of $f(x) = x - 5$

(c) $u = x^2yz - 4y^2z^2 + 2xz^3$ then find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$.

(d) $x = r\cos\theta$ and $y = r\sin\theta$, then find $\frac{\partial(x, y)}{\partial(r, \theta)}$.

(e) Prove that

$$\beta(l, m).\beta(l + m, n).\beta(l + m + n, p) = \frac{\Gamma l \Gamma m \Gamma n}{\Gamma(l + m + n + p)}.$$

(f) Evaluate $\iint e^{2x+3y}\,dxdy$ over the triangle bounded by $x=0, y=0, x+y=1$.

(g) Define Order and Degree of a differential equation.

(h) Find the general solution of $\frac{dy}{dx}=\frac{y}{x}$.

(i) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & 0 & 5 & 7 \end{bmatrix}$.

(j) The Eigen values of A are $1,2,3$ then find the Eigen values of A^2.

SECTION - B

2 Attempt any three parts of this question : **3×10=30**

(a) Differentiate: $y=(\log x)^{\cos x}$

(b) If $f(x)=x^3+8x^2+15x-24$, calculate the value of $f\left(\frac{11}{10}\right)$ by application of Taylor's series.

(c) Evaluate: $\int_0^1\int_0^1 \frac{dxdy}{\sqrt{(1-x^2)(1-y^2)}}$.

(d) Solve the following differential equation $\frac{dy}{dx}+2y=\sin x$.

(e) Find the characteristic equation of the matrix

$$A=\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$$ and hence compute A^{-1}.

SECTION C

Attempt any two parts from each question. All questions **(5×2)×5=50** are compulsory :

3 (a) Find the derivative of $\frac{\sin(ax+b)}{\cos(cx+d)}$ with respect to x.

(b) Evaluate: $\lim_{x\to 0}\frac{ax+x\cos x}{b\sin x}$.

(c) Integrate: $\int \frac{2x}{1+x^2}dx$

4 (a) If $u = x^2 + y^2$ then $\frac{\partial^2 u}{\partial x \partial y}$.

(b) If $\phi(x, y, x) = 0$, show that

$$\left(\frac{\partial y}{\partial z}\right)_x \left(\frac{\partial z}{\partial x}\right)_y \left(\frac{\partial x}{\partial y}\right)_z = -1.$$

(c) Examine the extreme values of $x^2 + y^2 + 6x + 12$

5 (a) Evaluate: $\int_0^1 x^5(1-x^3)^{10}dx$.

(b) Change the order of integration in $\int_0^a \int_y^a \frac{xdxdy}{x^2+y^2}$

hence evaluate the same.

(c) Find the area lying between parabola $y = 4x - x^2$ and the line $y = x$.

6 (a) Solve the differential equation $ylogydx - xd\ y=0$.

(b) Solve: $(1 + xy)ydx + (1 - xy)xdy = 0$.

(c) Solve: $\frac{dy}{dx} + \frac{1}{x}y = 3x^2y^3$.

7 (a) Find the inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ by elementary transformation.

(b) Discuss the consistency and solve the following system of linear equations

$x + y + z = -3; 3x + y - 2z = -2;\ 2x + 4y + 7z = 7$

(c) Find the Eigen values of the following matrix

$$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}.$$