USN 17MAT11

- ,Semester B.E. Degree Examination, Dec.2017/Jan.2018

Engineering Mathematics - 1

Time: 3 hrs. Max. Marks: 100

Note: Answer a full questions, choosing one full question from each module.

Module-I

1 a. Find the n^{th} derivative, *Of ,cosx* cos2x. **(06 Marks)**

b. Find the angle betweerill*(/eurves r = a log , $r = \frac{a}{\log e}$ **(07 Marks)**

c. Find the radius of curvature Of * curve r = a(1 + cos()) . **(07 Marks)**

OR

2 a. If y = a cos(log x) + bsin(log x) pio4that + (2n +1)xy,, + n^2 +1)y_n = 0 . **(06 Marks)**

b. With usual notations prove that the pedkl'ailiition in the for m, $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$ **(07 Marks)**

c. Find the radius of curvature of the curve = a – x) at the point (a, 0). **(07 Marks)**

Module-2

3 a. Find the Taylor's serisivof log,x. n powers of (x – I) upto fourth degree terms. **(06 Marks)**

b. If U = tan$^{-1}\left(\frac{x \; y}{x+y}\right)$, prove;that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ = sin 2U by using Euler s theorem. **(07 Marks)**

c. If U = x +3y^2 , V = , W 2z^2 – xy , evaluate $\frac{\partial(u, V, w)}{\partial(x, y, }$ at the point (1, 0). **(07 Marks)**

OR

4 a. Evaluate lim +II' +ex / 3 **(06 Marks)**

b. Find al' M*laurin's expansion of log(secx) upto x^4 terms. **(07 Marks)**

c. f(x, y) , where x = r cost) , y = r sin 0 , prove that $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{}\right)$ $\left(\frac{\partial z}{\partial r}\right)$ i • I az , (07 !Marks)

Module 3

5 a. A particle moves along the curve f = (t^3 -44)1+ (t^2 +40 j+(8t^2 -3t^3)i Find the velocity and acceleration vectors at time t and their magnitudes at t = 2. **(06 Marks)**

b. If f = (x + y +1)i +I – (x + y)ic , prove that f.curl = 0 . **(07 Marks)**

c. Prove that div(curl A) =0 . **(07 Marks)**

OR

6 a. A particle moves along the curve I' = $2t^2$I+(t^2 -4t)j+(3t - 5)k . Find the (components of velocity and acceleration along T-31+ 2k at t = 2. (06 Marks)

b. If —grad(x y + y^3z + z^3x - $x^2y^2z^2$) , find div f and curi f. (07 Marks)

c. Prove that curl(grad (0) = 0 . (07 Marks)

Module-4

7 a. Evaluate 2a ____ dx 2ax x` (06 Marks)

b. Solve $\frac{dy}{dx}$+ y tan x = y^3-sdc x (07 Marks)

C. Find the orthogonal trajec,tories of r" = cosn9 . (07 Marks)

OR

8 a. Find the reduction formula for icoex dx and hence evaluate cos" x dx . (06 Marks)

b. Solve $\frac{dy}{dx}\ \frac{ycosx+siny+y}{sinx+xcosy+x}$ = 0 (07 Marks)

c. A body originally at 80°C cools down to 60°Crin 20 minutes m the surroundings of temperature 40°C. Find the temperate of the bod y after 40 minutes from the original instant. (07 Marks)

Module-5

9 a. Find the ranleftthe matrix

‹2 5
A = 4 2 3
8 4 7 13
4 -3 --1

by reducing it to echelon form. (06 Marks)

b. Using the power method find the largest eigenvalue and the corresponding eigenvector of matrix A 6 --2 2 3 - 3) taking $(1, 1, 1)^T$ as the initial eigenvector. Petthrm five iterations. (07 Marks)

c. Show that the transformation $y_1 = x_1 + 2x_2 + 5x$, y, = 2x, + $4x_2$ +11x, ; +2x, is regular. Also, find the inverse transformation. (97 Marks)

OR

10 a. Solve the following system of equations by using Gauss-Jordan method:
x+y+z=9, x-2y+3z=8, 2x+y-z=3 (06 Marks)

b. Diagnolize the matrix A = I(-1 2 2 -1 (07 Marks)

C. Obtain the canonical form of $3x^2 + 5y^2 + 3z^2$ -2yz + 2zx - 2xy using orthogonal transformation. (07 Marks)