Level: Bachelor   Semester:Spring   Year   : 2019
Programme:BE   Full Marks: 100
Course: Engineering Mathematics II   Pass Marks: 45
    Time   : 3hrs.

*Candidates are required to give their answers in their own words as far
as practicable.*

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Find the equation to the plane through the line 2x+3y-5z-4=0=3x-4y+5z-6, parallel to the z-axis.   8

    b) Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 4$, $z = 0$ and is cut by the plane x + 2y + 3z = 0 in a circle of radius 3.   7

2. a) State and prove Euler's Theorem on homogenous function of two independent variable of degree n. if $u = Sin^{-1}\left(\frac{x^3+y^3+z^3}{ax+by+cz}\right)$ prove that   8

    $x\frac{du}{dx} + y\frac{du}{dy} + z\frac{du}{dz} = 2\tan u$

    b) A rectangular box open at the top, is to have a volume of 32C.C.Find the dimensions of the box requiring least material for its construction.   7

3. a) Evaluate the integral $\int_{0}^{4a} \int_{y^2/4a}^{y} \frac{x^2 - y^2}{x^2 + y^2} dxdy$ changing into polar co-ordinates.   8

    b) Find the volume of the solid cut from the first octant by the surface $Z = 4-x^2-y$.   7

4. a) Solve the equation $\frac{dy}{dx} + \frac{y\log y}{x} = \frac{y(\log y)^2}{x^2}$ 7

    b) Solve the initial value problem. y" + y' -2y = 14+ 2x – 2x^2 , y (0) = 0, y'(0) = 0.   8

5. a) Solve $y''-4xy'+(4x^2-2)y= 0$ by using power series method.   7

    OR

    Define Bessel equation and Bessel function of order n Also show that
    $\frac{d}{dx}[x^{-n}j_n(x)]=-x^{-n}j_{n+1}(x)$

    b) Find the general solution of   8
    $y'' – 4y' + 5y = e^{2x} \cosec x$ by using method of variation of parameter.

6. a) Define Laplace transform. Evaluate   8

    i) L(t^{2}sinwt) ii) $L^{-1}\left(\frac{1}{s^2(s^2 + w^2)}\right)$

    b) Using Laplace Transform solve the initial value problem   7
    $y'' – 3y' + 2y = 4t + e^{3t}$ $y(0) = y'(0) = -1$.

7. Attempt all the questions.   4×2.5

    a) Find the equation of plane which through (1,1,1) and parallel to the plane 3x -4y + 5z = 0.

    b) Find Laplace transform of e^{-2t} cost.

    c) Solve : $\frac{dy}{dx} + y\cot x = e^{\cos x}$,

    d) If $V = \sqrt{x^2 + y^2 + z^2}$ Show that $V_{xx} + V_{yy} + V_{zz} = \frac{2}{V}$