POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2018
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 length of perpendicular from the point (3,-1, 11) to the line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$. Also find the equation of perpendicular. 8

OR

Find the shortest distance between the lines: ax+by+cz+d=0 $a_1x+b_1y+c_1z+d_1$ and z-axis.

b) Find the equation of the sphere through the circle $x^2 + y^2 + z^2 = 1$, $2x + 4y + 5z = 6$ and touching the plane $z = 0$. 7

2. a) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ show that: $x^2\frac{\partial^2 u}{\partial x^2 u} + 2xy\frac{\partial^2}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = -\frac{\sin u \cos 2u}{4\cos^3 u}$ 7

b) If the sum of the dimension of a rectangular swimming pool is given, show that the amount of water in the pool is maximum when it is a cube. 8

3. a) Evaluate $\int_0^2 \int_0^{\sqrt{4-x^2}} \frac{xy}{\sqrt{x^2+y^2}} dy\,dx$ by changing polar integral. 7

b) Find the volume of the solid whose base is the region in xy-plane that is bounded by the parabola $y = 3 - x^2$, $y = 2x$ while the top is bounded by the plane $z = x + 1$. 8

4. a) Define order and degree of differential equations with suitable examples. Solve $\frac{dy}{dx} - y\tan x = 3e^{-\sin x}$ where y(0)=4. 7

b) Find the general solution of the differential equation $y'' - y = 2e^x + 6e^{2x}$. 8

5. a) Solve by power series method: $(1 + x)\,y^1 = y$. 7

OR

If $J_v(x)$ is the Bessel's function of order v. Prove that J

$_{v-1}(x) - J_{v+1}(x) = 2J_v'(x)$

b) Use method of variation of parameter to solve $y^{11} + 4y^1 + 5y = 10e^{2x}$ 8

6. a) Find the Laplace transform of 7
   i. tcosh at
   ii. t^2e^{-3t}

b) Solve by using Laplace transform: 8
$x^{11} + 2x^1 + 5x = e^{-t}\sin t, x(0) = 0, x^1(0) = 1$

7. Attempt all the questions: 2.5×
   a) Find the equation of the line passing through (1,5,3) and normal to the plane 2x+3y+7z=0 4
   b) Find the general solution of : $y''-a^2y=0$.
   c) If $f(x,y,z)=\frac{x}{y}+\frac{y}{z}+\frac{z}{x}$ show that $x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y} + z\frac{\partial f}{\partial z} = 0$
   d) Define Laplace transformation of f(t) and evaluate Laplace transform of Sin $(wt + \theta)$.