

# 國立屏東教育大學 99 學年度研究所碩士班入學考試

## 微積分(B)(含微分方程) 試題

(應用物理系光電暨材料碩士班)

※請注意：答案須寫在答案卷上，否則不予計分。

### 計算題 (共 100 分)

1.  $\frac{x^2}{4} + \frac{y^2}{9} = 1$ , find the tangent line to the curve at the point  $(1, \frac{3\sqrt{3}}{2})$ . (10%)

2.  $\lim_{x \rightarrow 0} \frac{\sin 4x}{9x}$ . (10%)

3.  $f(x) = \sin(x^2)\cos(x)e^{2x}$ , find  $\frac{df(x)}{dx}$ . (10%)

4.  $u(x, y) = e^{x-y} \sin(x+y)$ , Find  $\partial u/\partial x$  and  $\partial u/\partial y$ . (10%)

5.  $\int_1^2 \frac{x}{\sqrt{9+x^2}} dx$ . (10%)

6. Find the general solution of  $\frac{d^2 y}{dx^2} - 2\frac{dy}{dx} + y = 0$  (10%)

7. Evaluate the following integrals:

(a)  $\int_0^2 (x^3 + 3x + 2)\delta(1-x)dx$  (b)  $\int_{-2}^2 (2x+3)\delta(3x)dx$  (10%)

8. Consider the partial differential equation of  $\frac{\partial^2 u}{\partial x^2} = \frac{1}{\alpha} = \frac{\partial u}{\partial t}$  (15%)

With the boundary condition of

$$u=b \text{ at } x=0, t>0; \quad \frac{\partial u}{\partial t} = 0 \text{ at } x=1, t>0$$

And the initial condition of

$$u=0 \text{ for } t=0, \quad 0 \leq x \leq 1$$

Obtain the analytical solution as a function of  $x$  and  $t$ .

9. Calculate the volume integral of  $T=xyz^2$  over the prism of Fig. 1. (15%)

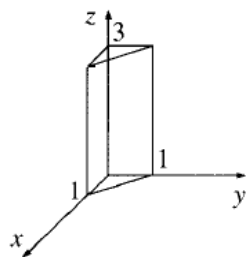


Fig. 1