

(Two papers due to re-exam) 14/06/2012 original paper

(3 Hours)

GN-1018

[ Total Marks 100

N.B.: 1. Question No. 1 is compulsory.

2. Attempt any four questions from remaining six questions.

3. Draw sketches wherever necessary.

Q.1.a. Evaluate:  $\int_0^1 (x \log x)^4 dx$  (5)

b. Solve:  $\frac{dr}{dt} = r \tan t \Rightarrow \frac{r^4}{\cos t}$  (5)

c. Evaluate:  $\int_0^{2\pi} \int_0^{\sqrt{a^2 - r^2}} \frac{r dr dt}{r^2 + a^2 + a^2}$  (5)

d. Find by double integration the area enclosed by  $y^2 = x^3$  and  $y = x$ . (5)

Q.2.a. Solve  $(4xy + 3y^2 - x) dx + x(x + 2y) dy = 0$  (6)

b. Change the order of integration  $\int_0^a \int_{\frac{a^2 - y^2}{a} - y}^{\frac{a^2 - y^2}{a}} f(x, y) dx dy$  (6)

c. Prove that  $\int_0^{\frac{\pi}{2}} \frac{dx}{(e^x + e^{-x})^2} = \frac{1}{4} \beta\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$  and hence evaluate  $\int_0^{\infty} \operatorname{sech}^2 x dx$ . (8)

Q.3.a. Using Euler's method find approximate value of  $y$  at  $x=1$  in five steps (6)

taking  $h=0.2$  given  $\frac{dy}{dx} = x + y$  &  $y(0) = 1$ .

b. Evaluate  $\int_0^1 \int_0^x \int_0^{x-y} e^{x+y+z} dz dy dx$  (6)

c. Evaluate by changing to polar coordinates  $\int_0^1 \int_r^{\sqrt{2a-x^2}} (x^2 + y^2) dy dx$  (8)

Q.4.a. Show that  $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx = \frac{\pi}{2} \log(1+a)$  (6)

b. Evaluate  $\int_R \int \frac{y dx dy}{(a-x)\sqrt{a^2-y^2}}$  where  $R$  is the region bounded by  $y^2 = ax$  &  $y = x$ . (6)

c. Solve by the method of variation of parameters  $(D^2 - 2D + 2)y = e^x \tan x$  (8)

Q.5.a. Solve  $(D^2 + 2)y = e^x \cos x + x^2 e^{2x}$  (6)

b. Using Taylor's Method Solve  $\frac{dy}{dx} = x^2 - y$  with  $y(0)=1$ . Also find  $y$  at  $x = 0.1$ . (6)

c. Find the Volume of the Tetrahedron bounded by the planes  $x = 0, y = 0, z = 0$  &  $x+y+z = a$  (8)

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