

Register Number:

Name of the Candidate:

**B.Sc. DEGREE EXAMINATION, May 2015****(MATHEMATICS)****(SECOND YEAR)****(PART - III)****GROUP-A: MAIN****640. ANALYSIS-II**

Time: Three hours

Maximum: 100 marks

**Answer any FIVE questions****(5 × 20 = 100)**

1. Evaluate the following:

(4×5=20)

a)  $\int \frac{dx}{1 + \tan x}$

b)  $\int \frac{6x+5}{\sqrt{6+x-2x^2}} dx$

c)  $\int \frac{dx}{(a^2 + x^2)^{\frac{3}{2}}}$

d)  $\int x^n \log x dx$

2. a) Show that  $\int_0^{\pi} \frac{x \tan x}{\sec x + \tan x} dx = \pi \left( \frac{\pi}{2} - 1 \right)$  (10)b) Prove that  $\int_0^{\pi/2} x^2 \sin x dx = \pi - 2$  (10)3. a) If  $I_n = \int_0^{\pi/2} x^n \cos x dx$ , show that  $I_n + n(n-1)I_{n-2} = \left( \frac{\pi}{2} \right)^n$ . Evaluate  $\int_0^{\pi/4} x^3 \cos^2 x dx$  (10)b) Find a reduction formula for  $\int \tan^n x dx$ . Hence evaluate  $\int \tan^4 x dx$ . (10)

4. Discuss the convergence of the following (5)

a)  $\int_1^{\infty} \frac{dx}{x^2}$

- b)  $\int_0^{\infty} \frac{dx}{a^2 + x^2}$  (5)
- c)  $\int_{-\infty}^0 e^x dx$  (5)
- d)  $\int_{-\infty}^0 \cosh x dx$  (5)
5. a) Find the moment of inertia of a solid sphere about its diameter. (10)
- b) Find the area bounded by the curve  $x^2=4y$ , the x-axis and  $x=2$ . (10)
6. a) Evaluate  $\iint_R xyz dx dy$ , where R is the region bounded by the line  $x+2y=2$ , lying in the first quadrant. (10)
- b) Evaluate  $\iiint_V xyz dx dy dz$ , where V is the region of space bounded by the coordinate planes and the sphere  $x^2+y^2+z^2=1$  and contained in the positive octant. (10)
7. a) Find the differential equation of the family of circles passing through the origin and having their centres on the x-axis. (6)
- b) Solve  $\frac{dy}{dx} + \frac{1+y^2}{1+x^2} = 0$  (4)
- c) Solve  $(x^3-3xy^2)dx - (y^3-3x^2y)dy=0$ . (10)
8. a) Solve  $(D^2+5D+6)y=e^{2x}$  given that  $y=0, y'=0$  when  $x=0$ . (10)
- b) Solve  $(D^2-4D+4)y=3x^2e^{2x}\sin 2x$  (10)
9. a) Solve  $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} - 5y = \sin(\log x)$  (10)
- b) Solve  $xy'' - 2(x+1)y' + (x+2)y = (x-2)e^{2x}$  (10)
10. a) Solve  $z=px+qy+p^2+pq+q^2$  (5)
- b) Solve  $pq+p+q=0$  (5)
- c) Solve  $px+qy=pq$  (10)
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