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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 $\int_0^{\pi} \frac{x\tan x}{\sec x+\tan x}dx = \pi\left(\pi/2 - 1\right)$ (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 $I_n + n(n-1)I_{n-2} = \left(\pi/2\right)^n$. 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) $\int_{-\infty}^{0} \cos hx\, dx$ (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 $\iint_R xy\,dx\,dy$, 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)
