

**End Semester Examinations - 2015-16 Even Semester - May 2016**

**14MA1002 Calculus and Statistics**

**Set B**

**Time : 3 hrs**  
**Total Marks: 100**

1. a). Solve by the method of variation of parameters  $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$ . (10)

b). Solve  $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$  (10)

**OR**

2. a). Solve the simultaneous equations  $\frac{dx}{dt} + y = \sin t$ ,  $\frac{dy}{dt} + x = \cos t$  given that (10)

$x = 2$  and  $y = 0$  when  $t = 0$ .

b). Solve  $(D - 2)^2 y = 8(e^{2x} + \sin 2x + x^2)$  (10)

3. a). Change the order of integration and hence evaluate  $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} xy \, dy \, dx$  (10)

b). Using triple integral, Find the volume of the sphere  $x^2 + y^2 + z^2 = a^2$  (10)

**OR**

4. a). Evaluate  $\iint r \sin \theta \, dr \, d\theta$  over the cardioids  $r = a(1 - \cos \theta)$  above the initial line. (10)

b). Evaluate  $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} \, dz \, dy \, dx$  (10)

5. a). State and prove the relation between the Beta and Gamma functions. (10)

b). Express the integral  $\int_0^{\frac{\pi}{2}} (\sqrt{\tan \theta} + \sqrt{\sec \theta}) \, d\theta$  in terms of Gamma integrals. (10)

**OR**

6. a). Express  $\int_0^1 x^m (1 - x^n)^p \, dx$  in terms of gamma functions and hence find the value

of  $\int_0^1 x^5 (1 - x^3)^{10} \, dx$  (10)

b). Prove that  $\int_0^1 \frac{x^2 \, dx}{\sqrt{1-x^4}} \times \int_0^\infty \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{2\sqrt{2}}$ . (10)

7.

- a). Calculate mean, median and mode from the following frequency distribution: (10)

Age	20 – 30	30 - 40	40 – 50	50 – 60	60 - 70	70 – 80	80 - 90
No. of members	3	61	132	153	140	51	2

- b). Find quartile deviation and the coefficient of quartile deviation from the following data: (10)

Wages per week(Rs.)	20-30	30 -40	40-50	50-60	60-70	70 & above
No. of persons	5	14	20	10	8	5

OR

8. a). Find the rank correlation coefficient for the following data: (8)

X	22	24	26	20	25	27	28	23	29	30
Y	18	20	28	23	22	27	24	21	25	29

- b). From the following data, find (12)

- The two regression equations
- The coefficient of correlation between the marks in Economics and Statistics
- The most likely marks in Statistics when marks in Economics is 30.

Marks in Economics	25	28	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

9.

- a). Solve  $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$  (10)

- b). Solve  $\frac{\partial^3 z}{\partial x^3} - 2 \frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x} + 3x^2 y$  (10)

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Wishing you All the Best

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