Reg. No. :

Question Paper Code : 72064

B.Arch. DEGREE EXAMINATION, APRIL/MAY 2017

First Semester

MA 6153 — MATHEMATICS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State DeMoiver's theorem.

2. The major and minor axis of an ellipse are 15.0 cm and 9.0 cm respectively. Find the approximate perimeter.

3. Find the equation of the plane which passes through the point (3, –3, 1) and parallel to the plane $2x + 3y + 5z + 6 = 0$.

4. Find the equation of the sphere having the points (–4, 5, 1) and (4, 1, 7) as ends of a diameter.

5. Compute the value of the integral $\int_0^{\pi/2} \sin^6 x \, dx$.

6. Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$.

7. Solve $(D^2 + 5D + 6)y = 0$.

8. Find the particular integral of $(D^2 + 6D + 9)y = e^{-3x}$.

9. Write merits and demerits of a mode of the frequency distribution.

10. Define mutually exclusive events with an example.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Prove that $\left(\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right)^n = \cos\left(\frac{n\pi}{2}-n\theta\right)+i\sin\left(\frac{n\pi}{2}-n\theta\right)$. (8)

(ii) If $\sin\alpha+\sin\beta+\sin\gamma=\cos\alpha+\cos\beta+\cos\gamma=0$, then prove that $\cos 3\alpha+\cos 3\beta+\cos 3\gamma = 3\cos(\alpha+\beta+\gamma)$. (8)

Or

(b) (i) Determine the area of a regular hexagon which has sides 8 cm long. (8)

(ii) A boiler consists of a cylindrical section of length 8m and diameter 6 m, on one end of which surmounted a hemispherical section of diameter 6 m and on the other end a conical section of height 4m and base diameter 6 m. Calculate the volume of the boiler and the total surface area. (8)

12. (a) (i) A variable plane at a constant distance p from the origin meets the axes in A, B, C. Planes are drawn through A, B, C parallel to the coordinate planes. Show that the locus of their point of intersection is given by $x^{-2}+y^{-2}+z^{-2}=p^{-2}$. (8)

(ii) Find, in symmetrical form, the equations of the line $x+y+z+1=0$, $4x+y-2z+2=0$. (8)

Or

(b) (i) Find the magnitude and the equations of the shortest distance between the lines $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$. (8)

(ii) Find the equations of the spheres passing through the circle $x^2+y^2+z^2-6x-2z+5=0$, $y=0$ and touching the plane $3y+4z+5=0$. (8)

13. (a) (i) Evaluate $\int \frac{x+4}{6x-7-x^2}\,dx$. (8)

(ii) Expand $e^{\sin x}$ by Taylor's series in power of x up to the terms containing x^4. (8)

Or

(b) (i) Derive the reduction formula for $\int \sin^n x\,dx$. (8)

(ii) Find the maximum and minimum values of $3x^4-2x^3-6x^2+6x+1$ in the interval (0, 2). (8)

14. (a) (i) Solve $(D-2)^2 y = 8\left(e^{2x} + \sin 2x\right)$. (8)

(ii) Solve $\left(x^2D^2 - xD + 1\right)y = \log x$. (8)

Or

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

(ii) Solve the simultaneous equations $\frac{dx}{dt} + 2y + \sin t = 0$, $\frac{dy}{dt} - 2x - \cos t = 0$, given that $x = 0$ and $y = 1$ when $t = 0$. (8)

15. (a) (i) Calculate the mean and standard deviation for the following frequency distribution: (8)

x:	8.5	16.5	24.5	32.5	40.5	48.5	56.5	64.5	72.5
f:	4	24	21	18	5	3	5	8	2

(ii) State and prove the addition law of probability. (8)

Or

(b) (i) Find the correlation coefficients for the following data: (8)

x:	105	104	102	101	100	99	98	96	93	92
f:	101	103	100	98	95	96	104	92	97	94

(ii) A pair of dice is tossed twice. Find the probability of scoring 7 points (1) once, (2) at least once (3) twice. (8)

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