

**300214 (14)**

BE (2<sup>nd</sup> Semester)

Examination, Nov.- Dec., 2012

Branch : AEI, Bio Tech., Chem., Civil, CSE,  
Elect., EEE, EI, ET & T, IT, Mech.,  
Mining & Lateral Diploma, Metallurgy,  
Mechatronics

**APPLIED MATHEMATICS-II**

*Time Allowed : Three Hours*

*Maximum Marks : 80*

*Minimum Pass Marks : 28*

**Note :** In each question part (a) is compulsory. Attempt

any two parts from rest of the three parts.

Q. 1. (a) Define De-moivers theorem. 2

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P.T.O.

Q. 1. (a) Prove that  $\left(\frac{\cos\theta + i \sin\theta}{\sin\theta + i \cos\theta}\right)^4 = \cos 8\theta +$

$i \sin 8\theta.$  2

(b) If  $2 \cos \theta = x + \frac{1}{x}$  and  $2 \cos \phi = y + \frac{1}{y}$ ,

show that  $x^m y^n + \frac{1}{x^m y^n} = 2 \cos (m\theta + n\phi).$  7

(c) If  $\tan (\theta + i\phi) = e^{\alpha}$ , show that : 7

$$\theta = \left(n + \frac{1}{2}\right) \frac{\pi}{2} \text{ and } \phi = \frac{1}{2} \log \tan \left(\frac{\pi}{4} + \frac{\alpha}{2}\right)$$

(d) Sum the following series : 7

$$\cos \theta - \frac{1}{2} \cos 2\theta + \frac{1}{3} \cos 3\theta - \dots \infty$$

Q. 2. (a) Solve : 2

$$\frac{d^3 y}{dx^3} + y = 0$$

(b) Solve : 7

$$x^2 \frac{d^2 y}{dx^2} + 5x \frac{dy}{dx} + 4y = x \log x$$

(c) Solve : 7

$$\frac{d^3 y}{dx^3} + 2 \frac{d^2 y}{dx^2} + \frac{dy}{dx} = e^{-x} + \sin 2x$$

(d) Solve the simultaneous equations : 7

$$\frac{dx}{dt} + 5x - 2y = t, \frac{dy}{dt} + 2x + y = 0, x = y = 0$$

when  $t = 0$

Q. 3. (a) Evaluate the following integral : 2

$$\int_1^2 \int_1^3 xy^2 dx dy$$

(b) Evaluate the following integral by changing the order of integration : 7

$$\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$$

(c) Given  $\int_0^{\infty} \frac{x^{n-1}}{1+x} dx = \frac{\pi}{\sin n\pi}$ , show that 7

$$\int_0^{\infty} \frac{x^{n-1}}{1+x} dx = \frac{\pi}{\sin n\pi}$$

(d) Find the area included between the parabola  $y = 4x - x^2$  and the line  $y = x$ . 7

Q. 4. (a) State Gauss divergence theorem. 2

(b) Find the directional derivative of  $\phi = x^2yz + 4xz^2$  at the point  $(1, -2, 1)$  in the direction of the vector  $2I - J - 2K$ . 7

(c) Verify Green's theorem for  $\int_C [xy + y^2] dx + x^2 dy$ , where C is bounded by  $y = x$  and  $y = x^2$ . 7

(d) Find the work done in moving a particle in the force field  $F = 3x^2\mathbf{i} + (2xz - y)\mathbf{j} + z\mathbf{k}$ , along the straight line from  $(0, 0, 0)$  to  $(2, 1, 3)$ . 7

Q. 5. (a) Solve the equation  $x^3 + 6x + 20 = 0$ , one root being  $1 + 3i$ . 2

(b) Solve the equation  $x^3 - 4x^2 - 20x + 48 = 0$ , given that the roots  $\alpha$  and  $\beta$  are connected by the relation  $\alpha + 2\beta = 0$ . 7

(c) Solve the equation  $6x^3 - 11x^2 - 3x + 2 = 0$ , given that its roots are in H.P. 7

(d) Solve the equation by Cardan's method : 7

$$x^3 - 18x + 35 = 0$$

