Reg. No.:....

Name:

Third Semester B.Tech. Degree Examination, January 2015 (2008 Scheme)

08.301 : ENGINEERING MATHEMATICS - II (CMPUNERFTAHBS)

Time: 3 Hours

:Max. Marks: 100

PART-A

Answer all questions. Each question carries 4 marks.





- 2. Find the area in the first quadrant bounded by the x-axis and the curves $x^2 + y^2 = 10$, $y^2 = 9x$.
- 3. Find the workdone by the force $\vec{F} = x\hat{i} + 2y\hat{j}$ when it moves a particle on the curve $2y = x^2$ from (0, 0) to (2, 2).
- 4. Find the half range sine series of f(x) = x in(0, 2).
- 5. Expand $f(x) = x^2$, $-\pi < x < \pi$ in a Fourier series.
- 6. Obtain the Fourier sine transform of $\frac{1}{x}$.
- 7. Find the p.d.e. of all spheres whose centres lie on the z-axis.
- 8. Solve $xp y^2q^2 = 1$.
- 9. Find the particular integral of $\nabla^2 u = -xy$.
- 10. If the solution of one-dimensional heat flow equation depends on Fourier cosine series, what would have been the nature of the end conditions.



PART-B

Answer one question from each Module. Each question carries 20 marks.

Module - I

- 11. a) Change the order of integration in the integral $I = \int_{0}^{a} \int_{x^2/a}^{2a-x} xy dy dx$ and evaluate it.
 - b) Find the volume enclosed by the paraboloid $x^2 + y^2 = 4z$ and z = 4.
 - c) Verify Green's theorem in a plane with respect to $\int_C (x^2 dx xy dy)$ where C is the boundary of the square formed by x = 0, y = 0, x = a, y = a.
- 12. a) Evaluate $\iint (x^2 + y^2) dxdy$ throughout the area enclosed by the curves y = 4x, x + y = 3, y = 0 and y = 2.
 - b) Evaluate $\oint (e^x dx + 2y dy dz)$ where C is the curve $x^2 + y^2 = 4$, z = 2.
 - c) Using divergence theorem show that $\int_{S} \nabla r^2 \cdot d\vec{s} = 6V$, where S is any closed surface enclosing a volume V.

Module - II

13. a) Find the Fourier series of $f(x) = x + x^2$, $-\pi < x < \pi$. Given that f(x) is periodic with period 2π using the series deduce that

i)
$$\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$$

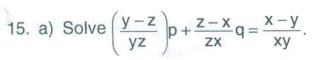
ii)
$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$$

- b) Obtain the Fourier cosine transform of $f(x) = \sin x$ in $0 < x < \pi$.
- c) What are Dirichlet's conditions for a Fourier series?



- 14. a) Show that $e^{\frac{-x^2}{2}}$ is self reciprocal.
 - b) Prove that $F[x^n f(x)] = (-i)^n \frac{d^n}{ds^n} F(s)$.
 - c) Write the Fourier sine series of K in $(0, \pi)$.

Module - III





- b) Solve $p^2x^2 + q^2y^2 = z^2$.
- c) A string of length 'l' is fastened at both ends. The midpoint of the string is taken to a height 'b' and then released from rest in that position. Find the displacement of the string.
- 16. a) Derive one-dimensional heat equation.
 - b) A bar 10 cm long with insulated sides has its ends A and B maintained at temperatures 50°C and 100°C respectively until steady-state conditions prevail. The temperatures at A is suddenly raised to 90°C and at the same time that at B is lowered to 60°C. Find the temperature distribution in the bar at time t.
 - c) Solve $(D^2 + D'^2)z = e^{x + 2y}$.