

Code No: 53007

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, December-2014

MATHEMATICS-III

(Common to EEE, ECE, EIE, ETM, ICE, AGE)

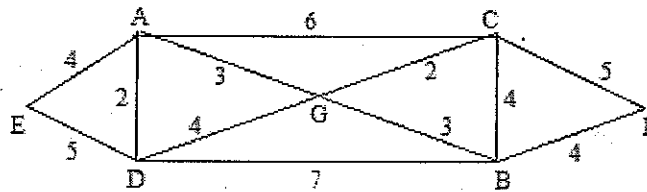
Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Using Beta (β) and Gamma (Γ) functions, prove that
- $$2^{2n-1} \Gamma(n) \Gamma\left(n + \frac{1}{2}\right) = \Gamma(2n) \sqrt{\pi}.$$
- b) Show that $J_{3/2}(x) = \sqrt{\frac{2}{\pi x}} \left(\frac{\sin x}{x} - \sin x \right).$
- 2.a) Prove that $\int_{-1}^1 P_n(x) dx = 0$ if $n \neq 0$.
- b) Prove that $(1-x^2)T_n' = nT_{n-1}(x) - nxT_n'(x).$
- 3.a) Define analytic function. Show that $f(z) = \sqrt{|xy|}$ is not analytic at the origin, even though Cauchy-Riemann equations are satisfied at that point.
- b) Find the analytic function $f(z) = u(r, \theta) + iv(r, \theta)$ such that $u(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2.$
- 4.a) Evaluate $\int_{1-i}^{2+i} (2x+1+iy) dz$ along $(1-i)$ to $(2+i).$
- b) State Cauchy's integral formula, use it to evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ around $C: |z-1| = 3.$
- 5.a) Find the Laurent's series of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in the annulus $1 < |z+1| < 3.$
- b) Express $f(z) = \frac{z}{(z-1)(z-3)}$ in a series of positive and negative powers of $(z-1).$
- 6.a) State Residue theorem and use it to evaluate $\int_C \frac{12z-7}{(2z+3)(z-1)^2} dz$ where $C: x^2 + y^2 = 4.$
- b) Evaluate $\int_0^{2\pi} \frac{1}{(5-3\sin\theta)^2} d\theta$ using Residue theorem.

- 7.a) Discuss the transformation $w = \sin z$.
- b) Find the bilinear transformation which maps $1, i, -1$ to $2, i, -2$ respectively. Find the fixed and critical points of the transformation.
8. Explain Prim's algorithm and use it to find a minimal spanning tree for the following graph.



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