SPECIAL SUPPLE B.TECH/AEIE/BT/CE/CHE/CSE/ECE/EE/IT/ME/2ND SEM/MATH 1201/2018

MATHEMATICS - II
(MATH 1201)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) The order and the degree of the differential equation $\frac{dy}{dx} + x = 0$ is
(a) 1,1 (b) 2,1 (c) 1,2 (d) 2,2.

(ii) $\frac{xdy-ydx}{x^2+y^2} =$
(a) $d\left(\frac{x}{y}\right)$ (b) $d\left\{log\left(\frac{x}{y}\right)\right\}$
(c) $d\left\{\tan^{-1}\left(\frac{y}{x}\right)\right\}$ (d) none of these.

(iii) A binary tree has exactly one vertex of degree
(a) 1 (b) 2 (c) 3 (d) 4.

(iv) The maximum number of edges in a simple connected graph with n vertices is
(a) n (b) $n-1$ (c) $\frac{n(n-1)}{2}$ (d) none of these.

(v) The number of edges in a tree with 50 vertices is
(a) 48 (b) 49 (c) 50 (d) 51.

(vi) $\frac{\Gamma(6)}{\Gamma(3)} =$
(a) 60 (b) 240 (c) 120 (d) none of these.

(vii) $\int_0^\infty \frac{Sint}{t} dt =$
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

(viii) If the planes $2x + 3y - 5z = 7$, $3x + 2y + kz = 4$ are perpendicular to each other the value of k is
(a) 1.2 (b) 3.6 (c) 2.4 (d) 4.8.

(ix) The direction cosines of the normal to the plane $x + 2y + 3z = 9$ are
(a) $\pm 1, \pm 2, \pm 3$ (b) $\pm\frac{1}{\sqrt{14}}, \pm\frac{2}{\sqrt{14}}, \pm\frac{3}{\sqrt{14}}$
(c) $\pm\frac{1}{\sqrt{6}}, \pm\frac{2}{\sqrt{6}}, \pm\frac{3}{\sqrt{6}}$ (d) $\pm\frac{1}{\sqrt{5}}, \pm\frac{2}{\sqrt{5}}, \pm\frac{3}{\sqrt{5}}$

(x) The value of $B\left(\frac{3}{2}, 2\right)$ is
(a) $\frac{4\pi}{15}$ (b) $\frac{4}{15}$ (c) 4π (d) none of these.

Group – B

2. (a) Solve $e^x sinydx + (e^x + 1)cosydy = 0$

(b) Solve
$\frac{dy}{dx} - \frac{y}{x+1} = e^x(x + 1)$

6 + 6 = 12

3. (a) Find the solution of $p^2 + 2xp - 3x^2 = 0$.

(b) Find the general solution of the following differential equation by D-operator method.
$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{4x}$.

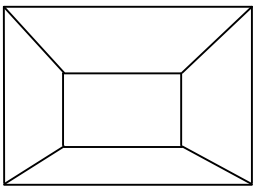
6 + 6 = 12

Group – C

4. (a) Show that a complete graph with n vertices has $\frac{n(n-1)}{2}$ edges.

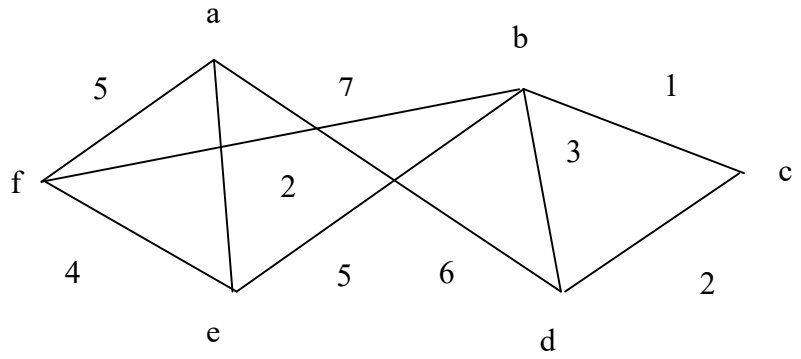
(b) Find the minimum and maximum number of edges of a simple graph with 10 vertices and 3 components.

(c) Check whether the following graph is bipartite. If yes then redraw it as bipartite graph.



4 + 4 + 4 = 12

5. (a) Apply the Kruskal's algorithm to find the spanning tree of the following graph.



(b) A tree has 4 vertices of degree 2, 3 vertices of degree 3 , 3 vertices of degree 4 . How many pendant vertices (vertex of degree 1) the tree should have?

7 + 5 = 12

Group – D

6. (a) Evaluate $\int_0^{\pi/2} Sin^7\,\theta Cos^4\theta d\theta$

(b) Evaluate $L\{Cos^2 t\}$.

6 + 6 = 12

7. (a) Evaluate $L^{-1}\{\frac{s+1}{s^2+6s+2}\}$.

(b) Solve the differential equation using Laplace transform:
$y'' + y = t$ where $y(0) = 1$ and $y'(0) = -2$

6 + 6 = 12

Group – E

8. (a) Find the length of the shortest distance between the straight lines $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ and $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$

(b) Find the ratio in which the line segment joining the points (2,-3,5) and (7,1,3) is divided by the xy–plane.

6 + 6 = 12

9. (a) A variable plane which is at a constant distance $3p$ from the origin O cuts the axes A, B, C. Show that the locus of the centroid of the triangle ABC is $x^{-2} + y^{-2} + z^{-2} = p^{-2}$.

(b) Find in the symmetrical form, the equation of the straight line $x - 2y + 3z = 4, 2x - 3y + 4z = 5$ and find its direction cosines.

6 + 6 = 12