

Notes:-

- 1) Attempt ALL groups.
- 2) ALL questions of group A are compulsory. Attempt ANY TWO questions from Group B and ANY TWO questions from Group C.
- 3) All questions of a group should be answered at one place.
- 4) Answer should be brief and to-the-point.
- 5) Any missing or wrong data may be assumed suitably giving proper justification.
- 6) Figures on the right-hand side margin indicate full marks.

Section -A

(0.5 x 8 = 4 marks)

Q.1 A general solution of second order partial differential equation $4u_{xx} - u_{yy} = 0$ is of the form $u(x, y) =$

* $f(x+4y)+g(x-4y)$ * $f(4x+y)+g(4x-y)$ * $f(x)+g(y)$ * $f(x+2y)+g(x-2y)$

Q.2 The P.D.E. $y u_{xx} + x u_{yy} = 0$ is hyperbolic in

* II and III quadrant * I and III quadrant * II and IV quadrant * I and II quadrant

Q.3 A general solution of second order partial differential equation $D^2 z = 0$ is $z =$

* $f(x) + y g(x)$ * $f(y) + x g(y)$ * $f(x) + g(y)$ * $f(y) + g(x)$

Q.4 A general solution of second order partial differential equation $(D^2 + a^2)z = 0$

* $z = \sum k^2 + a^2 = 0$ * $z = \sum h^2 + a^2 = 0$
* $z = \sum A e^{h x + k y}$ where $k^2 + a^2 = 0$ * $z = \sum A e^{h x + k y}$ where $h^2 + a^2 = 0$

Q.5 P.I of the equation $(D^2 - 2DD' + D'^2)z = e^{2x+2y}$

* $\frac{x}{4} e^{2x+2y}$ * $\frac{1}{2} e^{2x+2y}$ * $\frac{x^2}{2} e^{2x+2y}$ * $\frac{x}{2} e^{2x+2y}$

Q.6 The P.D.E. $Au_{xx} + 2Bu_{xy} + Cu_{yy} = 0$ is elliptic if

* $B^2 - 4AC = 0$ * $B^2 - AC < 0$ * $B^2 - 4AC < 0$ * $B^2 - 4AC > 0$

Q.7 Partial differential equation of one dimensional heat equation is

* $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ * $u_{xx} + u_{yy} = 1$ * $u_{xx} + u_{yy} = 0$ * $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

Q.8 In one dimensional heat flow, the condition on temperature is

* temperature increases as time increases * temperature remains always non zero at all times
* temperature decreases as distance increases * temperature decreases as time increases

Section - B

(2x3=6 marks)

Attempt any two Questions.

Q.1 Solve the partial differential equation $2s + t - 3q = 5 \cos(3x - 2y)$

Q.2 Solve the partial differential equation $p + 3q = 5z + \tan(y - 3x)$

Q.3 Solve the partial differential equation $(4D^2 - 4DD' + D'^2)z = 16 \log(x + 2y)$

Section -C

(2x5=10 marks)

Attempt any two Questions.

Q.1 Using the method of separation of variables solve the partial differential equation

$4 \frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} = 3u$ given that $u(x, 0) = 3e^{-x} - e^{-5x}$

Q.2 Solve the partial differential equation

$(D^2 + DD' - 6D'^2)z = x^2 \sin(x + y)$

Q.3 Solve the equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$, under the conditions

$u(0, t) = 0$ and $u(l, t) = 0,$

$\frac{\partial u}{\partial t} = 0$, when $t = 0,$ $u(x, 0) = 9 \sin \frac{2\pi x}{l}, 0 < x < l$