Q.1. The non-zero solution of heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ with conditions (i) u is not infinite for $t \to \infty$
(ii) $u_x(0,t) = u_x(l,t) = 0$ (iii) $u(x,0) = lx - x^2$, $0 < x < l$
is given by.

(a) ~~C1+C2.~~ $u(x,t) = (C_1 + C_2 x)$ (b) $u(x,t) = (C_1 e^{\lambda x} + C_2 e^{-\lambda x}) e^{-c^2\lambda^2 t}$

(c) $u(x,t) = (C_1 \cos \lambda x + C_2 \sin \lambda x) e^{-c^2\lambda^2 t}$ (d) none of these.

Q.2 The non-zero temperature in a bar whose ends $x=0$ and $x=l$ are insulated and initial temperature is $k \sin 2\pi x$ is given by. [where $u(x,t)$ represent temperature and t is time, x is length of bar].

(a) $u(x,t) = C_1 + C_2 x$ (b) $u(x,t) = (C_1 e^{\lambda x} + C_2 e^{-\lambda x}) e^{-c^2\lambda^2 t}$

(c) $u(x,t) = (C_1 \cos \lambda x + C_2 \sin \lambda x) e^{-c^2\lambda^2 t}$ (d) none of these.

Q.3. The initial condition and B.C. of above problem is

(a) $u(x,0) = k \sin 2\pi x$ (b) $u(0,t) = 0$ (c) $u(l,t) = 0$

(d) none of these (e) (a)(b)(c).

Q.4. The non-zero solution of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, which satisfies the following boundary conditions.
$u(0,y) = u(a,y) = u(x,0) = 0$, $u(x,b) = \sin \frac{n\pi x}{a}$ is given by.

(a). $u(x,y) = (C_1 + C_2 x)(C_3 + C_4 y)$ (b) $u(x,y) = (C_1 e^{\lambda x} + C_2 e^{-\lambda x})(C_3 \cos \lambda y + C_4 \sin \lambda y)$

(c) $u(x,y) = (C_1 \cos \lambda x + C_2 \sin \lambda x)(C_3 e^{\lambda y} + C_4 e^{-\lambda y})$

Q.5 The non-zero solution of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, which satisfies the following boundary conditions.
~~u(0~~ $u(x,0) = u(x,b) = u(0,y) = 0$, $u(a,y) = \sin \frac{n\pi y}{b}$ is.

Given by.

Option is same as Q.4.

Q.6. The solution of $u_{xx} + u_{yy} = 0$, with b.c. $u(0,y) = u(\pi,y) = 0$ $\forall y$.
$u(x,0) = \sin x$, $u(x,\infty) = 0$, $0 < x < \pi$ is.

(a). $e^{-y} \sin y + \sin x$ (b). $\sin x\, e^{-y}$ (c) $\sin x$ (d) $\sin x\, e^{-y} + e^{-2y} \sin 2x$.

Q.7. The solution of $u_t = c^2 u_{xx}$ with conditions.

~~$u_t(x,0)=0$, u~~ $u(0,t) = u(\pi,t) = 0$, $u(x,0) = 3\sin 2x$ is

(a) $3\sin 2x$ (b) $3+\sin 2x$ (c) $3\sin 2x\, e^{-4c^2 t}$ (d) none of these

Q.8. The solution of $u_t = c^2 u_{xx}$ with conditions $u(0,t) = u(l,t) = 0$ is given by.

(a) $u(x,t) = \sum_{n=1}^{\infty} A_n \sin \frac{n\pi}{l} x \, e^{-\left(\frac{n\pi}{l}\right)^2 c^2 t}$ (b) $u(x,t) = \sum_{n=1}^{\infty} A_n \sin \frac{n\pi x}{l} \, e^{\frac{n^2\pi^2}{l^2} c^2 t}$

(c) none of these.

Q.9. The possible solutions of $u_t = c^2 u_{xx}$ are

(a) $u(x,t) = c(c_1 + c_2 x)$ (b) $u(x,t) = (c_1 e^{\lambda x} + c_2 e^{-\lambda x})\, e^{\lambda^2 c^2 t}$

(c) $u(x,t) = (c_1 \cos\lambda x + c_2 \sin\lambda x)\, e^{-\lambda^2 c^2 t}$ (d) all of these.

Q.10 The possible solutions of $u_{xx} + u_{yy} = 0$ are

(a) $u(x,y) = (c_1 + c_2 x)(c_3 + c_4 y)$ (b) $u(x,y) = (c_1 e^{\lambda x} + c_2 e^{-\lambda x})(c_3 \cos\lambda y + c_4 \sin\lambda y)$

(c) $u(x,y) = (c_1 \cos\lambda x + c_2 \sin\lambda x)(c_3 e^{\lambda y} + c_4 e^{-\lambda y})$ (d) all of these.

Q.11 The solution of $u_{xx} + u_{yy} = 0$ with b.c.

$u(0,y) = u(\pi,y) = u(x,\infty) = 0$, $u(x,0) = 3\sin 2x$ is given by

(a). $3\sin 2x\, e^{-2y}$ (b) $3\sin 2x$. (c) $3\sin 2x + e^{-2y}$ (d) $2\sin 3x\, e^{-3y}$.

Q.12 The solution of $u_{xx} + u_{yy} = 0$ with b.c.

$u(x,0) = u(x,\pi) = 0$, $u(\infty,y) = 0$, $0 < y < \pi$, $u(0,y) =$ ~~$3\sin 2y$~~ $= 3\sin 2y$.

is given by.

(a). $3\sin 2x\, e^{-2y}$ (b) $3\sin 2y\, e^{-2x}$ (c) $2\sin 3x\, e^{-3y}$. (d) $2\sin 3y\, e^{-3x}$.

Q.13

Q.13 The non-zero solution of $u_{xx}+u_{yy}=0$ with b.c. $u_y(x,0)=u_y(x,b)=0 \ldots(*)$, $u(0,y)=0$, $u(a,y)=f(y) \ldots(**)$ is given by

(a) $(c_1+c_2x)(c_3+c_4y)$ (b) $(c_1e^{\lambda x}+c_2e^{-\lambda x})(c_3\cos\lambda y+c_4\sin\lambda y)$

(c) $(c_1\cos\lambda x+c_2\sin\lambda x)(c_3e^{\lambda y}+c_4e^{-\lambda y})$ (d) (a) and (b) both

(e) ~~(c)~~ (c) and (a) both.

Q.14 Which of the following is b.c. on x; $0<x<a$.

(a) ~~$u(0,x)$~~ $u(0,y)=0$ (b) $u(a,y)=0$. (c) $u(0,y)=0$, $u(a,y)=0$

(d) $u(\frac{a}{2},y)=f(y)$

Q.15 Which of the following is I.C. on x.

(a) $u(0,y)=0$ (b) $u(0,y)=u(a,y)=0$ (c) $u(0,y)=0$, $u(a,y)=f(y)$

Q.16. In Q.13 $(*)$ is.

(a) b.c (b) I.C.

Q.17. In Q.13 ~~eq.~~ $(**)$ is.

(a) b.c. (b) I.C.

Q.16. The possible solution of $\frac{\partial^2u}{\partial t^2}=c^2\frac{\partial^2u}{\partial x^2}$ are

(a) $(c_1+c_2x)(c_3+c_4t)$ (b) $(c_1e^{\lambda x}+c_2e^{-\lambda x})(c_3e^{\lambda t}+c_4e^{-\lambda t})$ ~~$(c_3\cos\lambda t+c_4\sin\lambda t)$~~

(c) $(c_1\cos\lambda x+c_2\sin\lambda x)(c_3\cos\lambda ct+c_4\sin\lambda ct)$ (d) All of these.

Q.17. The non-zero solution of $u_{tt}=c^2u_{xx}$ with following boundary and initial conditions. $u(0,t)=u(a,t)=0$, $t>0$; $\left[\frac{\partial u}{\partial t}\right]_{(t=0)}=0$, $0<x<a$ and $u(x,0)=k(ax-x^2)$, $0<x<a$ is given by.

~~a~~ option are same as. Q.16.

Q.18. The b.c. in Q.17 is.

(a) $u(0,t)=u(a,t)=0$

(b) $u(0,t)=0$

(c) $u(x,0)=k(ax-x^2)$

(d) $[u_t]_{(t=0)}=0$

Q.19 The I.C. in Q.17 are

option is same as. Q.18.