

# Assignment 6

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GATE-2008:ME

- 1) A set of 5 jobs is to be processed on a single machine. The processing time (in days) is given in the table below. The holding cost for each job is Rs. $K$  per day.

Job	Processing Time
P	5
Q	2
R	3
S	2
T	1

A schedule that minimizes the total inventory cost is

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- a) T-S-Q-R-P                      c) T-R-S-Q-P  
b) P-R-S-Q-T                      d) P-Q-R-S-T

- 2) For generating a Coon's surface we require

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- a) a set of grid points on the surface  
b) a set of grid control points  
c) four bounding curves defining the surface  
d) two bounding curves and a set of grid control points

- 3) Internal gear cutting operation can be performed by

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- a) milling  
b) shaping with rack cutter  
c) shaping with pinion cutter  
d) hobbing

- 4) Consider the shaded triangular region  $P$  shown in the figure. What is  $\iint_P xy dx dy$ ?

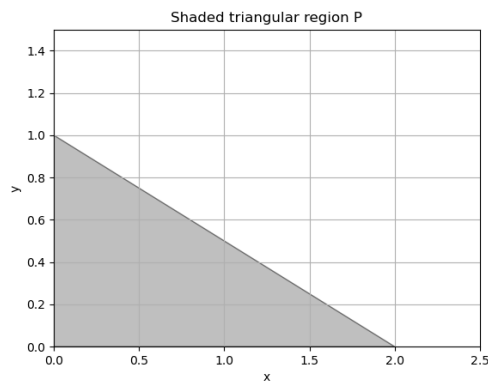


Fig. 1

(GATE-ME:2008)

- a)  $\frac{1}{6}$                       b)  $\frac{2}{9}$                       c)  $\frac{7}{16}$                       d) 1

5) The directional derivative of the scalar function  $f(x, y, z) = x^2 + 2y^2 + z$  at the point  $P = (1, 1, 2)$  in the direction of the vector  $\mathbf{a} = 3\hat{i} - 4\hat{j}$  is

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- a)  $-4$                       c)  $-1$   
b)  $-2$                       d) 1

6) For what value of  $a$ , if any, will the following system of equations in  $x, y, z$  have a solution?

$$2x + 3y = 4 \quad (1)$$

$$x + y + z = 4 \quad (2)$$

$$x + 2y - z = a \quad (3)$$

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- a) Any real number                      c) 1  
b) 0                      d) There is no such value

7) Which of the following integrals is unbounded?

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- a)  $\int_0^{\pi/4} \tan x \, dx$                       c)  $\int_0^1 x e^{-x^2} \, dx$   
b)  $\int_0^1 \frac{1}{x^2+1} \, dx$                       d)  $\int_0^1 \frac{1}{1-x} \, dx$

8) The integral  $\oint f(z)dz$  evaluated around the unit circle on the complex plane for  $f(z) = \frac{\cos z}{z}$  is

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- a)  $2\pi i$                       b)  $4\pi i$                       c)  $-2\pi i$                       d) 0

9) The length of the curve  $y = \frac{2}{3}x^{3/2}$  between  $x = 0$  and  $x = 1$  is

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- a) 0.27                      b) 0.67                      c) 1                      d) 1.22

10) The eigenvectors of the matrix

$$\begin{pmatrix} 1 & 2 \\ 0 & 2 \end{pmatrix}$$

are written in the form  $\begin{pmatrix} 1 \\ a \end{pmatrix}$  and  $\begin{pmatrix} 1 \\ b \end{pmatrix}$ . What is  $a + b$ ?

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- a) 0                      b)  $\frac{1}{2}$                       c) 1                      d) 2

11) Let  $f = x^y$ . What is  $\frac{\partial^2 f}{\partial x \partial y}$  at  $x = 2, y = 1$ ?

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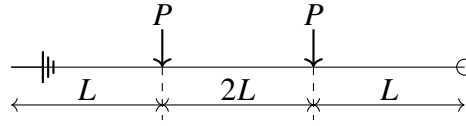
- a) 0                      b)  $\ln 2$                       c) 1                      d)  $\frac{1}{\ln 2}$

12) It is given that  $y'' + 2y' + y = 0$ ,  $y(0) = 0$ ,  $y(1) = 0$ . What is  $y(0.5)$ ?

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- a) 0                      b) 0.17                      c) 0.62                      d) 1.13

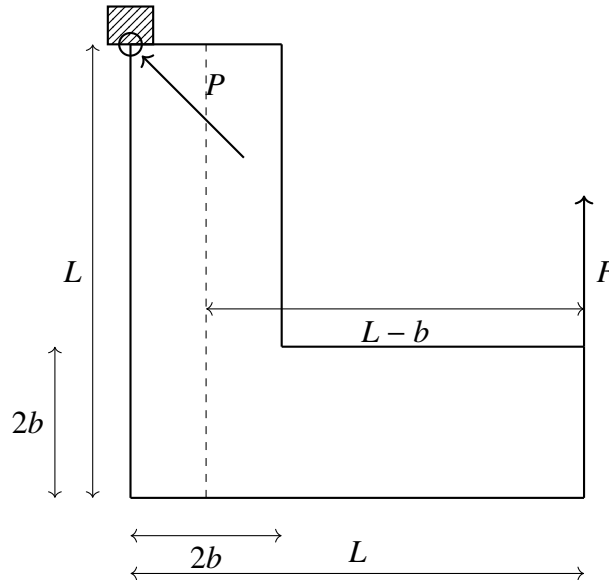
13) The strain energy stored in the beam with flexural rigidity  $EI$  and loaded as shown in the figure is



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- a)  $\frac{P^2 L^3}{3EI}$                       c)  $\frac{4P^2 L^3}{3EI}$   
 b)  $\frac{2P^2 L^3}{3EI}$                       d)  $\frac{8P^2 L^3}{3EI}$

14) For the component loaded with a force  $F$  as shown in the figure, the axial stress at the corner point  $P$  is



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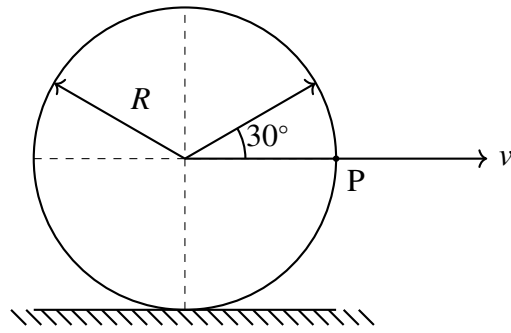
- a)  $\frac{F(3L-b)}{4b^3}$                       b)  $\frac{F(3L+b)}{4b^3}$                       c)  $\frac{F(3L-4b)}{4b^3}$                       d)  $\frac{F(3L-2b)}{4b^3}$

15) A solid circular shaft of diameter 100 mm is subjected to an axial stress of 50 MPa. It is further subjected to a torque of 10 kNm. The maximum principal stress experienced on the shaft is closest to

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- a) 41 MPa                      b) 82 MPa                      c) 164 MPa                      d) 204 MPa

16) A circular disk of radius  $R$  rolls without slipping at a velocity  $v$ . The magnitude of the velocity at point  $P$  is



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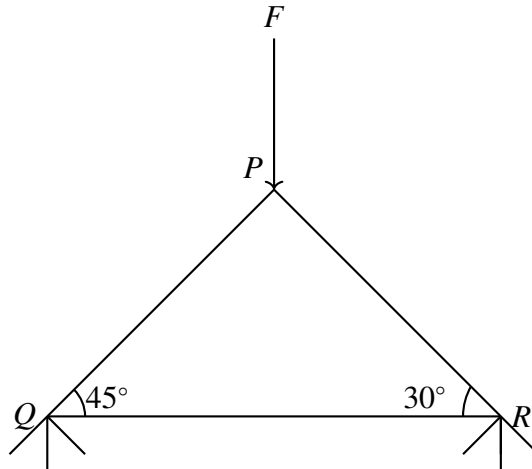
a)  $\frac{\sqrt{3}}{v}$

b)  $\frac{\sqrt{3}v}{2}$

c)  $\frac{v}{2}$

d)  $v\sqrt{3}$

17) Consider a truss PQR loaded at  $P$  with a force  $F$  as shown in the figure. The tension in the member  $QR$  is



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a)  $0.5F$

b)  $0.63F$

c)  $0.73F$

d)  $0.87F$