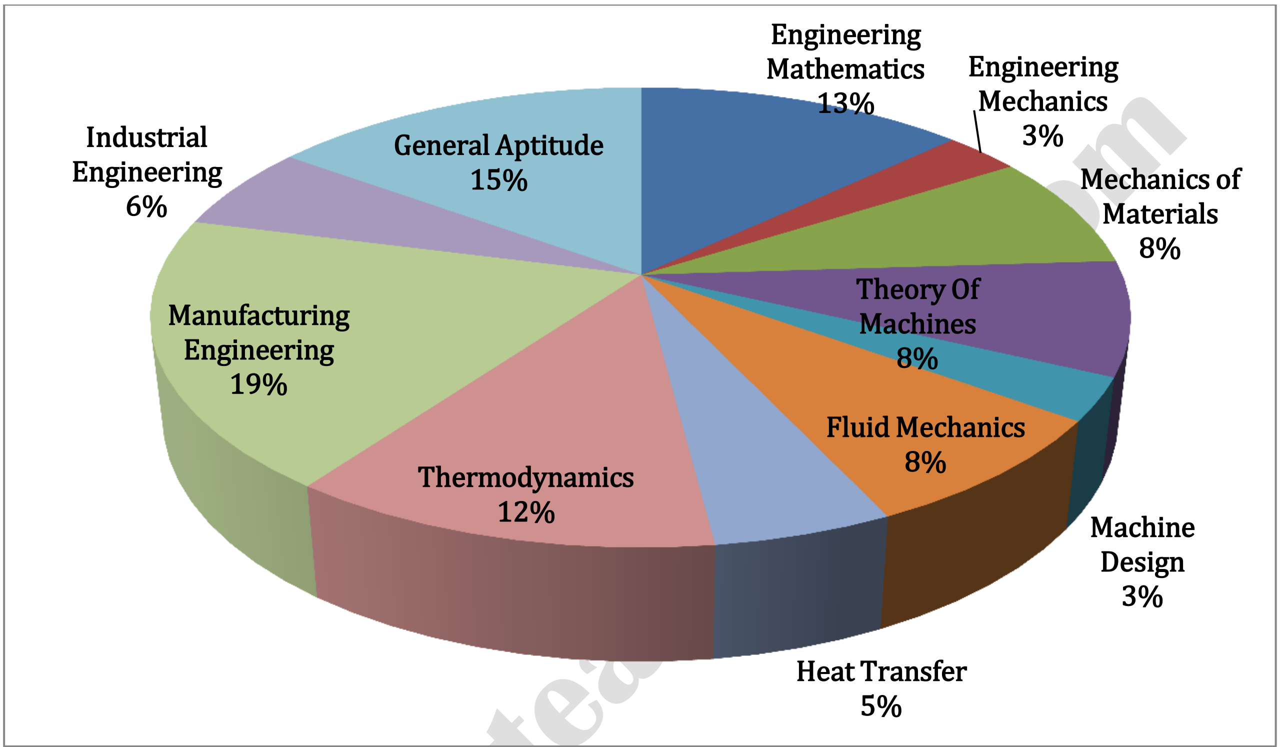
ANALYSIS OF GATE 2018*(Memory Based)

Mechanical Engineering



ME ANALYSIS-2018_3-Feb_Afternoon

SUBJECT	No. of Ques.	Topics Asked in Paper(Memory Based)	Level of Ques.	Total Marks
Engineering Mathematics	1 Marks: 5 2 Marks: 4	Random Variable, Complex Variable, Divergence, Complementary Function, Determinant, Variable Separable Method, Fourier Series	Easy	13
Engineering Mechanics	1 Marks:1 2 Marks: 1	Slider Crank Mechanism, Collision	Medium	3
Mechanics of Materials	1 Marks: 2 2 Marks: 3	Columns, Simple Stress and Strain	Medium	8
Theory Of Machines	1 Marks: 2 2 Marks: 3	Gear Strain, Vibration, Torsion, Cams	Medium	8
Machine Design	1 Marks: 1 2 Marks: 2	Bearing Capacity, Breaks	Easy	3
Fluid Mechanics	1 Marks: 2 2 Marks: 3	Fluid Properties, Flow through pipes	Medium	8
Heat Transfer	1 Marks: 1 2 Marks: 2	Radiation, Convection	Easy	5
Thermodynamics	1 Marks: 2 2 Marks: 5	Ideal Gas, IC Engine, Vapour compression cycle, Refrigeration	Medium	12
Manufacturing Engineering	1 Marks: 7 2 Marks: 6	Milling, Metal Cutting, Forming, EDM	Tough	19
Industrial Engineering	1 Marks: 2 2 Marks: 2	Inventory Management, Linear Programming	Tough	6
General Aptitude	1 Marks: 5 2 Marks: 5	Geometry, TSD, Functions, Grammar, Numbers, Work, inference	Easy	15
Total	**65**			**100**
Faculty Feedback	Majority of the question were concept based. General Aptitude And Mathematics is Very Easy. Core Subject Questions were 50% easy, 30% medium and 20% tough.			

GATE 2018 Examination*(Memory Based)

Mechanical Engineering

Test Date: 3-Feb-2018

Test Time: 2:00 PM 5:00 PM

Subject Name: Mechanical Engineering

General Aptitude

1. A contract is to be completed in 52 days and 125 identical robots where employed each operated for 7 hr/day. After 39 days , $\left(\frac{5}{7}\right)^{th}$ of work was completed. How many additional robots would be required to complete the work on time. If each robot is now operational for 8 hrs a day
[Ans. 7]

2. Complete the Series:
BC FGH LMNO________?
[Ans. TUVWX]

3. $\frac{1}{1+\log_u vw}+\frac{1}{1+\log_v wu}+\frac{1}{1+\log_w uv}=?$
[Ans. 1]

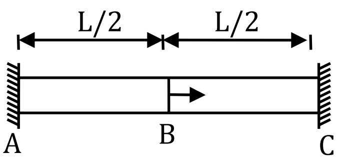
4. Perimeter of circle, square and equilateral triangle are equal then
(A) Area of circle will be maximum.
(B) Area of square will be maximum.
(C) Area of equilateral triangle will be maximum.
(D) All area will be equal.
[Ans. A]

5. The dress ________ her, that they all ________ her for appearance.
[Ans. A]
Complemented, Complimented

6. A wire bent over square has area of $1936\ m^2$. Wire is cut into two parts a and b such that a = 3b. Now' a' is bent over square and' b' bent over circle. Find out the sum of area of square and circle
[Ans. *]Range: 1243 to 1243

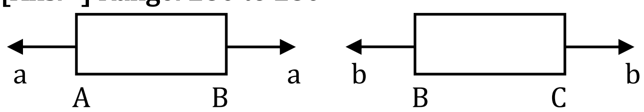
Technical

1. A bimetallic cylindrical bar of cross sectional area $1m^2$ is made by steel and aluminum as shown. To maintain axial strain 10^{-6} in both steel and aluminum (10^{-6} tensile in steel and 10^{-6} compressive in Al) The force P = ________kN.



$E_{steel} = 210$ GPa
$E_{A1} = 70$ GPa

[Ans. *] Range: 280 to 280



$a - b = P \qquad \ldots .①$

$$\left(\frac{aL}{AE}\right) - \left(\frac{bL}{AE}\right) = 0$$

$$\frac{a\left(\frac{L}{2}\right)}{(1)(210)} + \frac{(b)\left(\frac{L}{2}\right)}{(1)(70)} = 0$$

$$\Rightarrow \left(\frac{a}{21}\right) + \left(\frac{b}{7}\right) = 0$$

$$\Rightarrow \frac{a}{3} + b = 0 \qquad \ldots\ldots .②$$

From ① and ②

$$a + \frac{a}{3} = P \Rightarrow \left(\frac{4a}{3}\right) = P$$

$$a = \left(\frac{3P}{4}\right)$$

$$b = \left(\frac{3P}{4}\right) - P = -\frac{P}{4}$$

$$\text{Also,} \frac{aL}{AE} = (10^{-6} \times L)$$

$$\left(\frac{3P}{4}\right)\left(\frac{L}{AE}\right) = (10^{-6} \times L)$$

$$\left(\frac{3}{4}\right)\frac{(P)}{AE} = 10^{-6} \Rightarrow P = \frac{4 \times 10^{-6} \times (1) \times 210 \times 10^9}{3}$$

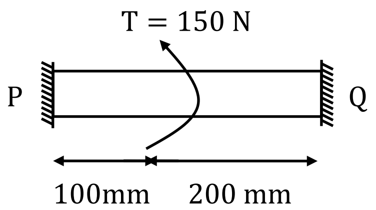
$$= 280 \times 10^3 \text{N}$$

$P = 280$ kN

2. Minimum axial compressive load required to initiate buckling for a pinned –pinned slender column with bending stiffness EI and length L is ________

Ans: $\mathbf{\frac{\pi^2 EI}{L^2}}$

3. If the bar is loaded with a torsional load of 150 Nm as shown. Find the torsional reaction at P and Q



(A) 100,50
(B) 50,100
(C) 50,50
(D) 100,100

[Ans. A]

$T = a + b$

$\theta_{PR} = \theta_{RQ}$

$\Rightarrow \left(\frac{aL}{GJ}\right)_{PR} = \left(\frac{bL}{GJ}\right)_{RQ} \Rightarrow a(0.1) = b(0.2)$

$a = 2b$

$J = 3b$

$b = \frac{J}{3} = 50$

$a = \frac{2J}{3} = 100$

4. Given scalar function $\phi = \ln(r)$, then find its radiant $\nabla\phi = ?$

Given $\left(\vec{r} = xi + yj + zk, |\vec{r}| = r = \sqrt{x^2 + y^2 + z^2}\right)$

(A) r
(B) $\frac{\vec{r}}{|r|}$
(C) $\frac{\vec{r}}{\vec{r}.\vec{r}} = \frac{\vec{r}}{r^2}$
(D) $\frac{\vec{r}}{|r|^3}$

[Ans. C]

5. A wire bent over square has area of 1936 m^2, wire is cut into two parts a and b such that a=3s. Now ‘a’ is bent over square and ‘s’ is bent over circle.
Find out the sum of area of square and circle

[Ans. *] Range: 1243 to 1243

6. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 1 \end{bmatrix}$ then $\det(A^{-1}) =$ ________

[Ans. *] Range: 0.25 to 0.25

$|A^{-1}| = \frac{1}{|A|} = \frac{1}{4} = 0.25$

$|A| = 1 \times 4 \times 1 = 4$

7. For an ordinary DE $y^3 \frac{dy}{dx} + x^3 = 0$ and $y(0) = 1$ then $y(-1) =$ ________

[Ans. *]Range: 1.4 to 1.5

8. For a Fourier series $f(x) = a_0 + \sum_{n=1}^{\infty} a_n \cos(nx)$ the value of co-efficient of function $f(x) = \cos^2 x$ in $[0 \quad \pi]$ is ________

$\left[\mathbf{Ans.}\, \mathbf{a_0} = \frac{\mathbf{1}}{\mathbf{2}}, \mathbf{a_2} = \frac{\mathbf{1}}{\mathbf{2}}\right]$

9. The divergence of vector field $\vec{u} = e^x(\cos yi + \sin yi)$ is ________

[Ans. *]$2e^x$ cosy

Divergence of vector field $\vec{u} = \nabla . \vec{u}$

$\nabla = \hat{i}\frac{\partial}{\partial x} + \hat{j}\frac{\partial}{\partial y} + \hat{k}\frac{\partial}{\partial z}$

$\nabla = \vec{u} = e^x \cos y + e^x \cos y$

$= 2e^x \cos y$

10. Consider a function 'u' which depends on position 'x' and time 't'. The partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ is known as

(A) Wave equation

(B) Heat equation

(C) Laplace equation

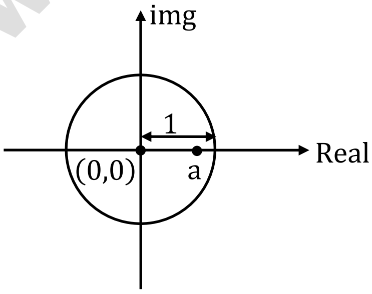
(D) Energy equation

[Ans. B]

11. For a counter clockwise integration around a unit circle centered at origin

$\oint_c \frac{1}{5z-4} dz = A\pi i$, The value of 'A' is ________

[Ans. *]Range: 0.4 to 0.4



$$\oint_c \frac{f(z)}{(z-a)}\,dz = 2\pi i f(a)$$

$$\oint_c \frac{\left(\frac{1}{5}\right)}{\left(z-\frac{4}{5}\right)}\,dz = 2\pi i f\,(a)\ f(z) = \frac{1}{5}$$

Here $a = \frac{4}{5}$

$= 2\pi i\left(\frac{1}{5}\right)$

$= \left(\frac{2}{5}\right)\pi i$

$A = \frac{2}{5} = 0.4$

12. $y^3\,\frac{dy}{dx} + x^3 = 0$, given $y(0) = 1$, then find $y(-1) = 0$

[Ans. *]Range: 0 to 0

$y^3 dy = -x^3 dx$

Apply integration on both sides

$\int y^3\ dy = -\int x^3\ dx$

$\frac{y^4}{4} = -\frac{x^4}{4} + c$

$\frac{y^4 + x^4}{4} = c$

$\Rightarrow y(0) = 1$

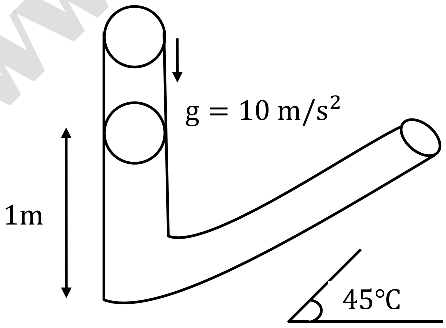
$\frac{1+0}{4} = c \Rightarrow = \frac{1}{4}$

$\frac{x^4 + y^4}{4} = \frac{1}{4}$

$x^4 + y^4 = 1$

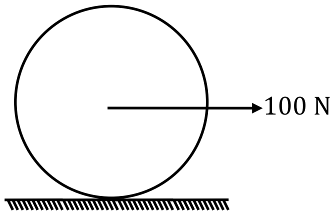
$y(-1) = 1 - 1 = 0$

13. A ball is dropped from a height of 1m in a friction less tube. If the tube profile is approximated as straight line the total distance travelled by the ball is ________ [Neglecting the curved position]



[Ans. *]Range: 2.2 to 2.6

14. A disc of mass 10 kg and radius 1 m is acted upon by a 100N force at the centre as shown Find the linear acceleration of center of the disc?



$m = 10$ kg

[Ans. *]Range: 6.4 to 7

15. Let x_1 and x_2 be two independent exponential distribution R.V with mean 0.5 and 0.25 respectively . Then $y = \min(x_1\ x_2)$ is
(A) Exponential distribution with mean is 1/6
(B) Exponential distribution with mean is 2
(C) Normal distribution with mean is ¾
(D) Normal distribution with mean is 1/6
[Ans. A]

16. The problem of maximizing $z = x_1 - x_2$ subject to constraints $x_1 + x_2 \leq 10; x_1 \geq 0$ and $x_2 \leq 5$ has
(A) No solution
(B) One solution
(C) Two solution
(D) More solution
[Ans. B]

17. The peak wave length of radiation emitted by a black body at a temperature of 2000 k is 1.45 μm. If the peak wave length of emitted radiation changes to 2.90 μm, then the temperature (in k) of the black body is ________ (k)
[Ans. *]Range: 1000 to 1000

18. In a steam power plant steam is condensed in a condenser at 30°C. The cooling water enters the condenser at 30°C . The cooling water enters the condenser at 14°C and leaves at 12°C. If the total surface area of tubes is $50 m^2$ and overall heat transfer co-efficient is $2000\ w/m^2k$ then heat transfer to the condenser is ________
[Ans. *] Updating soon

More Questions Update Soon