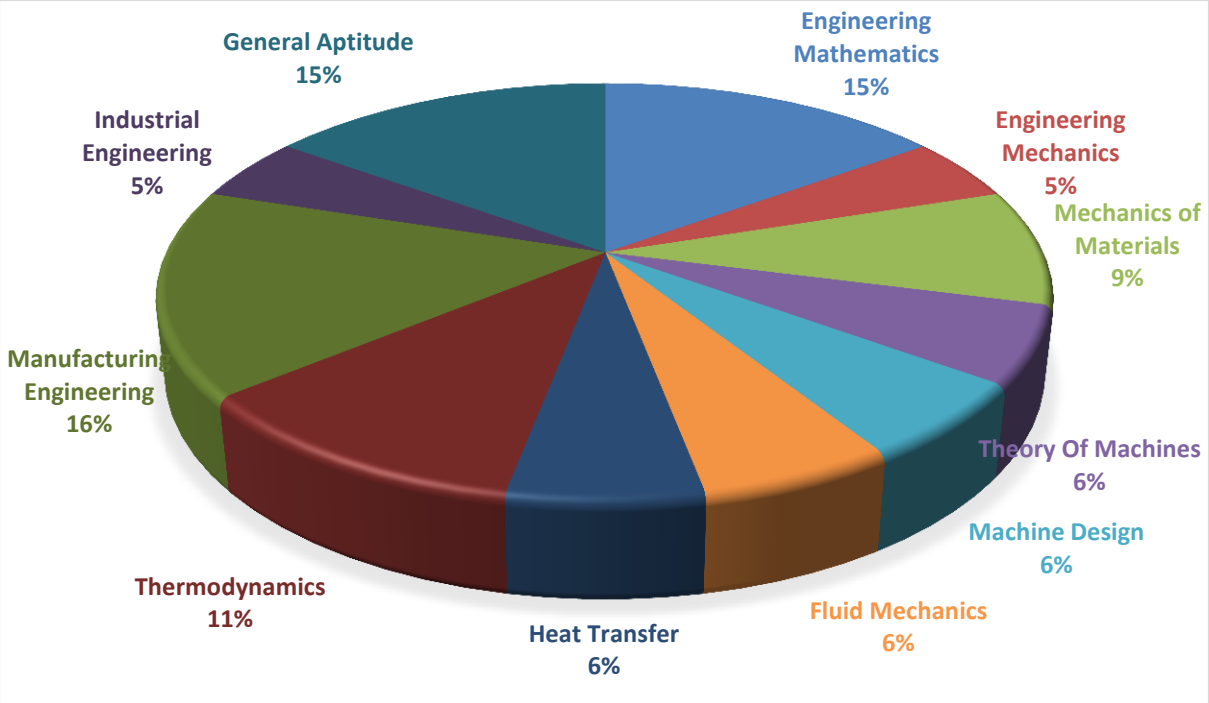
ANALYSIS OF GATE 2019

Memory Based

Mechanical Engineering



ME ANALYSIS-2019_2-Feb_Morning

SUBJECT	No. of Ques.	Topics Asked in Paper(Memory Based)	Level of Ques.	Total Marks
Engineering Mathematics	1 Marks: 7 2 Marks: 4	Mean Value Theorem; Probability , Euler's Method, Rank, Analytic Function, Laplace Transform	Easy	15
Engineering Mechanics	1 Marks: 1 2 Marks: 2	Friction, Trusses /frames	Medium	5
Mechanics of Materials	1 Marks: 1 2 Marks: 4	Stresses-Strain Diagram, Column and Struts, Torsion	Easy	9
Theory Of Machines	1 Marks: 2 2 Marks: 2	Gear Strain	Medium	6
Machine Design	1 Marks: 2 2 Marks: 2	Theories of failure	Easy	6
Fluid Mechanics	1 Marks: 2 2 Marks: 2	Turbine, Viscosity	Easy	6
Heat Transfer	1 Marks:2 2 Marks: 2	Convection	Medium	6
Thermodynamics	1 Marks: 3 2 Marks: 4	Entropy, Rankine Cycle	Medium	11
Manufacturing Engineering	1 Marks: 6 2 Marks: 5	Forming, Metal Cutting,	Tough	16
Industrial Engineering	1 Marks: 1 2 Marks: 2	Forecasting, Scheduling	Medium	5
General Aptitude	1 Marks: 5 2 Marks: 5	Geometry, TSD, Functions, Grammar, Numbers, Work, inference	Easy	15
Total	65			100
Faculty Feedback	Easy Questions Covering a wider range of topics rather than going too deep in important topics			

General Aptitude

GATE 2019 Examination* (Memory Based)

Mechanical Engineering

Test Date: 2-FEB-2019

Test Time: 9:30 AM to 12:30 PM

Subject Name: Mechanical Engineering

General Aptitude

Q.1 - Q.5 Carry One Mark each.

1. If the sum of two numbers is 26 and product is 165. The difference between the number is
   (A) 4
   (B) 6
   (C) 3
   (D) 5
   [Ans. A]
   Given,
   $(a + b) = 26$
   $(a * b) = 165$
   $\because (a + b)^2 = (a - b)^2 + 4ab$
   $(26)^2 = (a - b)^2 + (4 * 165)$
   $\Rightarrow (a - b)^2 = 676 - 660$
   $\Rightarrow (a - b)^2 = 16$
   $\therefore (a - b) = 4$

2. A

3. A

4. A

5. A

Coming Soon

Q.6 - Q.10 Carry Two Mark each.

6. A prisoner is allowed to say one statement before he is given the punishment. If he says a true statement, he is hanged and if says a false statement then he is shot. What would have the prisoner said so that the judge has to release him without giving the punishment
(A) You committed the crime.
(B) I committed the crime
(C) I will be shot
(D) I didn't committed the crime
[Ans. C]

7. A

8. A

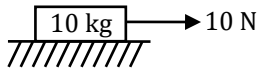
9. A

10. A

Technical

Q.1 - Q.25 Carry One Mark each.

1. A block of mass 10 kg rests on a horizontal floor. The $g = 9.81\frac{m}{s^2}, \mu = 0.2$. A 10 N force is applied on the block. The magnitude of force of friction



2. A solid cube of side 1m is kept at a temp of 32°C $\propto = 1 \times 10^{-5°C}$ k = 200GPa ,if the cube is constrained all around and heated to 42°C, the magnitude of volumetric stress due to heating is _____

3. As per common practice 3 types of hydraulic turbines in decreasing order of flow rate of hydraulic turbines
   (A) Pelton, francis, Kaplan
   (B) Francis , pelton, Kaplan
   (C) Kaplan, francis, pelton
   (D) Francis, Kaplan, pelton

4. For fully developed laminar flow through pipes of uniform circular cross-section if Nussle's No. corresponding to uniform heat flux is N_{u_q} & that corresponding to uniform wall temperature is N_{u_T} which of the following relations is correct.
   (A) $N_{u_q} < N_{u_T}$
   (B) $Nu_q = (N_{u_T})^2$
   (C) $N_{u_q} = N_{u_T}$
   (D) $N_{u_q} > N_{u_T}$

5. By simple 3 months moving average method the demand forecast of the product for the month of September.

Month	December
Jan	450
Feb	440
March	460
April	510
May	520
June	495
July	475
Aug	560

   (A) 536.67
   (B) 530
   (C) 490
   (D) 510

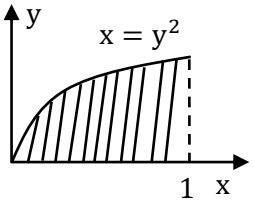
6. If $\frac{dy}{dx} + 7x^2y = 0$ & $y(0) = \frac{3}{7}$, Then find y(1)?

(A) $\frac{3}{7}e^{-\frac{3}{7}}$ (B) $\frac{7}{3}e^{-\frac{7}{3}}$

(C) $\frac{7}{3}e^{-\frac{3}{7}}$ (D) $\frac{3}{7}e^{-\frac{7}{3}}$

7. Evaluation of $\int_2^4 x^3\,dx$ using a 2 –equal segment trapezoidal rule gives _____

8. A Parabolic $x = y^2$ with $0 \le x \le 1$ as shown in figure. The volume obtained by solid of rotating the shaded area of 360° around the x – axis



(A) π (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{2}$ (D) 2π

9. Evaluate $\int_1^e x \ln x\ dx$

10. The length of large stocks of Titanium rods follow normal distribution with $\mu = 440$ mm and standard deviation 1 mm. What is the percentage of rods whose length lie between 438 mm and 441 mm?

(A) 81.85%
(B) 68.4%
(C) 86.64%
(D) 99.75%

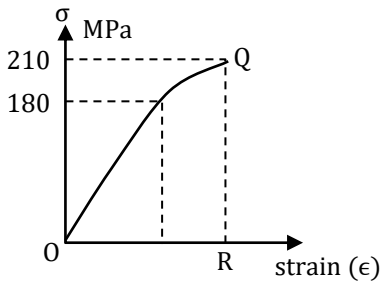
11. For the matrix $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

How many distinct Eigen values are there?

(A) 0
(B) 3
(C) 1
(D) 2

12. A rod of diameter 10mm and length 1m is fixed at one end. the other end is twisted by an angle 10°, by applying torque if maximum shear strain is $P \times 10^{-3}$ then P=_____

13. Metal was loaded in uniaxial tension starting from 'O' upon loading the stress curve passes through initial yield point 'P' , then strain hardens to point Q where loading is stopped . From Q the specimen was unloaded to R , where stress is zero . If the same specimen is reloaded intension from point R the value of stress which at the material yields again is _____MPa



14. If all the activities other than 'S' take the estimated time, the maximum duration (in weeks) of the activity 'S' without delaying the project completion _____

Activity	Precedence	Activity Time(in weeks)
P	-	5
Q	-	1
R	Q	2
S	P,R	4
T	P	6
U	S,T	3

15. Total processing time is _____

	Machines				
Jobs	1	2	3	4	5
1	40	30	50	50	58
2	26	38	60	26	38
3	40	34	28	24	30
4	28	40	40	32	48
5	28	32	38	22	44

16. A slender mod of length L and diameter d (L>>d) and thermal conductivity K_1 is joined with another rod of identical dimensions, but of conductivity K_2, to from a composite cylindrical rod of length 2L. The heat transfer in radial direction and contact resistance are negligible. The effective thermal conductivity of the composite mod is

(A) $\frac{2K_1K_2}{K_1+K_2}$

(B) $\frac{K_1K_2}{K_1+K_2}$

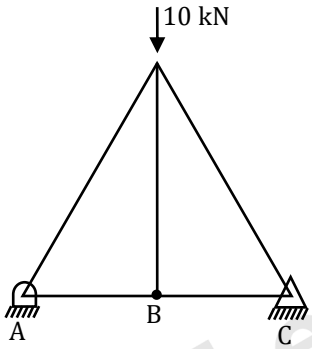
(C) $K_1 + K_2$

(D) $\sqrt{K_1K_2}$

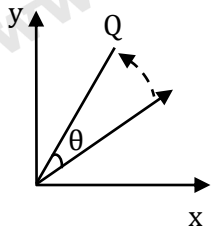
17. A gas is heated in a duct as it flows over a resistance heater. Consider a 101kW electric heater Gas enters the heating section at 100 kpa, 27°C with a volumetric flow rate $15m^3$/sec. Heat flows from the gas in the duct to the surrounding with a rate of 51kW. Find the exit temperature of the gas.

2 Marks:

1. Magnitude of force in member BC _____



2. The position vector $\overrightarrow{OD}$ of P(20, 10) is rotated anticlockwise in XY plane by an angle of 30° such that the point P occurs position Q as shown. The coordinates of Q are



(A) (22.32, 8.26)

(B) (12.32, 18.66)

(C) (13.4, 22.32)

(D) (18.66, 12.32)

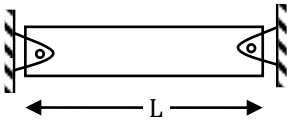
3. For the set of equations
$x + y + z = 1$
$ax - ay + 3z = 5$
$5x - 3y + az = 6$
has infinite solution if a=_____
(A) 4
(B) 3
(C) -3
(D) -4

4. The variable X takes a value between 0 & 10 with uniform probability distribution. The variable Y takes a value between 0 & 20 with uniform probability distribution. The probability of the sum of variable (X+Y) being greater than 20 is
(A) 0.25
(B) 0.5
(C) 0
(D) 0.33

5. A harmonic function is analytic if it satisfies Laplace equation. If $u(x, y) = 2x^2 - 2y^2 + 4xy$ is a harmonic function, then its conjugate harmonic function v(x, y) is
(A) $4y^2 - 4xy + C$
(B) $4xy - 2x^2 + 2y^2 + C$
(C) $-4xy + 2y^2 - 2x^2 + C$
(D) $2x^2 - 2y^2 + xy + C$

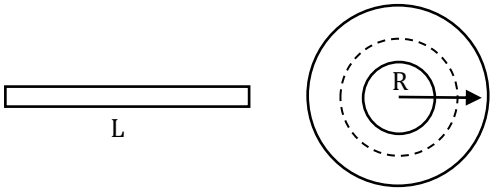
6. The state of stress is $\sigma_{xx} = 100$ Mpa, $\sigma_{yy} = 200$ Mpa, $\sigma_{xy} = \sigma_{yx} = 80$ Mpa. The yield strength is 460 Mpa. The factor of safety on basis of max stress theory is _____?

7. Bar of length 'L' = πm primed at two ends as shown in figure. The beam has cross section of square 6mm side E = 200GPa $\alpha = 3 \times 10^{-6}$/°Ck Minimum temp rise required to cause bucking of beam is _____k

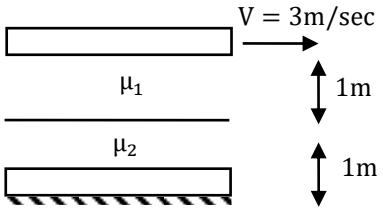


8. In UTM, experiment L = 100m was loaded in tension until failure. The failure load was 40kN. The displacement measured using the cross head motion, at failure was 15mm. The compliance of UTM is constant and is given by 5×10^{-8}m/N. the strain at failure in sample is _____%

9. Beam of length L = 10πm with cross section (a)=5mm E=200GPa, Beam is bent in such a way that two ends meet to form a circle . Eulerbernoulli theory is applicable maximum tensile bending stress is _____MPa



10. Two immiscible incompressible fluids having same densities but different viscosities are contained between two infinite parallel plates 2m apart as shown below.



11. A cube of side 100mm is placed at the bottom of a container . The density of cube material is 800bg/m^3. A liquid of density 1000bg/m^3 is poured into the container. The minimum height to which the liquid should be poured into the container to just lift the block from the bottom?