SESSION - 4

GATE 2014: General Instructions during Examination

1. Total duration of the GATE examination is **180** minutes.
2. The clock will be set at the server. The countdown timer at the top right corner of screen will display the remaining time available for you to complete the examination. When the timer reaches zero, the examination will end by itself. You need not terminate the examination or submit your paper.
3. Any useful data required for your paper can be viewed by clicking on the **Useful Common Data** button that appears on the screen.
4. Use the scribble pad provided to you for any rough work. Submit the scribble pad at the end of the examination.
5. You are allowed to use a non-programmable type calculator, however, sharing of calculators is not allowed.
6. The Question Palette displayed on the right side of screen will show the status of each question using one of the following symbols:

The **Marked for Review** status for a question simply indicates that you would like to look at that question again. *If a question is answered, but marked for review, then the answer will be considered for evaluation unless the status is modified by the candidate.*

Navigating to a Question :

7. To answer a question, do the following:
    a. Click on the question number in the Question Palette to go to that question directly.
    b. Select an answer for a multiple choice type question by clicking on the bubble placed before the 4 choices, namely A, B, C and D. Use the virtual numeric keypad to enter a number as answer for a numerical type question.
    c. Click on **Save & Next** to save your answer for the current question and then go to the next question.
    d. Click on **Mark for Review & Next** to save your answer for the current question and also mark it for review, and then go to the next question.

Caution: Note that your answer for the current question will not be saved, if you navigate to another question directly by clicking on a question number without saving the answer to the previous question.

You can view all the questions by clicking on the **Question Paper** button. This feature is provided, so that if you want you can just see the entire question paper at a glance.

<u>Answering a Question :</u>

8. Procedure for answering a multiple choice (MCQ) type question:
    a. Choose one answer from the 4 options (A,B,C,D) given below the question, click on the bubble placed before the chosen option.
    b. To deselect your chosen answer, click on the bubble of the chosen option again or click on the **Clear Response** button.
    c. To change your chosen answer, click on the bubble of another option.
    d. To save your answer, you MUST click on the **Save & Next** button.

9. Procedure for answering a numerical answer type question:
    a. To enter a number as your answer, use the virtual numerical keypad.
    b. A fraction (e.g. -0.3 or -.3) can be entered as an answer with or without '0' before the decimal point. As many as four decimal points, e.g. 12.5435 or 0.003 or -932.6711 or 12.82 can be entered.
    c. To clear your answer, click on the **Clear Response** button.
    d. To save your answer, you MUST click on the **Save & Next** button

10. *To mark a question for review, click on the **Mark for Review & Next** button. If an answer is selected (for MCQ) or entered (for numerical answer type) for a question that is **Marked for Review**, that answer will be considered in the evaluation unless the status is modified by the candidate.*

11. To change your answer to a question that has already been answered, first select that question for answering and then follow the procedure for answering that type of question.
12. Note that ONLY Questions for which answers are ***saved*** or ***marked for review after answering*** will be considered for evaluation.

<u>Choosing a Section :</u>

13. Sections in this question paper are displayed on the top bar of the screen. Questions in a Section can be viewed by clicking on the name of that Section. The Section you are currently viewing will be highlighted.
14. A checkbox is displayed for every optional Section, if any, in the Question Paper. To select the optional Section for answering, click on the checkbox for that Section.
15. If the checkbox for an optional Section is not selected, the **Save & Next** button and the **Mark for Review & Next** button will NOT be enabled for that Section. You will

only be able to see questions in this Section, but you will not be able to answer questions in the Section.

16. After clicking the **Save & Next** button for the last question in a Section, you will automatically be taken to the first question of the next Section in sequence.

17. You can move the mouse cursor over the name of a Section to view the answering status for that Section.

Changing the Optional Section :

18. After answering the chosen optional Section, partially or completely, you can change the optional Section by selecting the checkbox for a new Section that you want to attempt. A warning message will appear along with a table showing the number of questions answered in each of the previously chosen optional Sections and a checkbox against each of these Sections. Click on a checkbox against a Section that you want to reset and then click on the **RESET** button. Note that RESETTING a Section will DELETE all the answers for questions in that Section. Hence, if you think that you may want to select this Section again later, you will have to note down your answers for questions in that Section. If you do not want to reset the Section and want to continue answering the previously chosen optional Section, then click on the **BACK** button.

19. If you deselect the checkbox for an optional Section in the top bar, the following warning message will appear: "Deselecting the checkbox will DELETE all the answers for questions in this Section. Do you want to deselect this Section?" If you want to deselect, click on the **RESET** button. If you do not want to deselect, click on the **BACK** button.

20. You can shuffle between different Sections or change the optional Sections any number of times.

GATE 2014 Examination

ME: Mechanical Engineering

Duration: **180 minutes**   *Maximum Marks*: **100**

Read the following instructions carefully.

1. To login, enter your Registration Number and password provided to you. Kindly go through the various symbols used in the test and understand their meaning before you start the examination.
2. Once you login and after the start of the examination, you can view all the questions in the question paper, by clicking on the **View All Questions** button in the screen.
3. This question paper consists of **2 sections**, General Aptitude (GA) for **15 marks** and the subject specific GATE paper for **85 marks**. Both these sections are compulsory.
   The GA section consists of **10** questions. Question numbers 1 to 5 are of 1-mark each, while question numbers 6 to 10 are of 2-mark each.
   The subject specific GATE paper section consists of **55** questions, out of which question numbers 1 to 25 are of 1-mark each, while question numbers 26 to 55 are of 2-mark each.
4. Depending upon the GATE paper, there may be useful common data that may be required for answering the questions. If the paper has such useful data, the same can be viewed by clicking on the **Useful Common Data** button that appears at the top, right hand side of the screen.

5. The computer allotted to you at the examination center runs specialized software that permits only one answer to be selected for multiple-choice questions using a mouse and to enter a suitable number for the numerical answer type questions using the virtual keyboard and mouse.
6. Your answers shall be updated and saved on a server periodically and also at the end of the examination. The examination will **stop automatically** at the end of **180 minutes**.
7. In each paper a candidate can answer a total of 65 questions carrying 100 marks.
8. The question paper may consist of questions of **multiple choice type** (MCQ) and **numerical answer type**.
9. Multiple choice type questions will have four choices against A, B, C, D, out of which only **ONE** is the correct answer. The candidate has to choose the correct answer by clicking on the bubble (◯) placed before the choice.
10. For numerical answer type questions, each question will have a numerical answer and there will not be any choices. **For these questions, the answer should be entered** by using the virtual keyboard that appears on the monitor and the mouse.
11. All questions that are not attempted will result in zero marks. However, wrong answers for multiple choice type questions (MCQ) will result in **NEGATIVE** marks. For all MCQ questions a wrong answer will result in deduction of ⅓ marks for a 1-mark question and ⅔ marks for a 2-mark question.
12. There is **NO NEGATIVE MARKING** for questions of **NUMERICAL ANSWER TYPE**.

13. Non-programmable type Calculator is allowed. Charts, graph sheets, and mathematical tables are **NOT** allowed in the Examination Hall. You must use the Scribble pad provided to you at the examination centre for all your rough work. The Scribble Pad has to be returned at the end of the examination.

Declaration by the candidate:

"I have read and understood all the above instructions. I have also read and understood clearly the instructions given on the admit card and shall follow the same. I also understand that in case I am found to violate any of these instructions, my candidature is liable to be cancelled. I also confirm that at the start of the examination all the computer hardware allotted to me are in proper working condition".

Q. 1 – Q. 5 carry one mark each.

Q.1 Which of the following options is the closest in meaning to the word underlined in the sentence below?

In a democracy, everybody has the freedom to <u>disagree</u> with the government.

(A) dissent (B) descent (C) decent (D) decadent

Q.2 After the discussion, Tom said to me, 'Please revert!'. He expects me to _____.

(A) retract (B) get back to him (C) move in reverse (D) retreat

Q.3 While receiving the award, the scientist said, "I feel vindicated". Which of the following is closest in meaning to the word 'vindicated'?

(A) punished (B) substantiated (C) appreciated (D) chastened

Q.4 Let $f(x, y) = x^n y^m = P$. If x is doubled and y is halved, the new value of f is

(A) $2^{n-m} P$ (B) $2^{m-n} P$ (C) $2(n - m)P$ (D) $2(m - n)P$

Q.5 In a sequence of 12 consecutive odd numbers, the sum of the first 5 numbers is 425. What is the sum of the last 5 numbers in the sequence?

Q. 6 – Q. 10 carry two marks each.

Q.6 Find the next term in the sequence: 13M, 17Q, 19S, __

(A) 21W (B) 21V (C) 23W (D) 23V

Q.7 If 'KCLFTSB' stands for 'best of luck' and 'SHSWDG' stands for 'good wishes', which of the following indicates 'ace the exam'?

(A) MCHTX (B) MXHTC (C) XMHCT (D) XMHTC

Q.8 Industrial consumption of power doubled from 2000-2001 to 2010-2011. Find the annual rate of increase in percent assuming it to be uniform over the years.

(A) 5.6 (B) 7.2 (C) 10.0 (D) 12.2

Q.9   A firm producing air purifiers sold 200 units in 2012. The following pie chart presents the share of raw material, labour, energy, plant & machinery, and transportation costs in the total manufacturing cost of the firm in 2012. The expenditure on labour in 2012 is Rs. 4,50,000. In 2013, the raw material expenses increased by 30% and all other expenses increased by 20%. What is the percentage increase in total cost for the company in 2013?
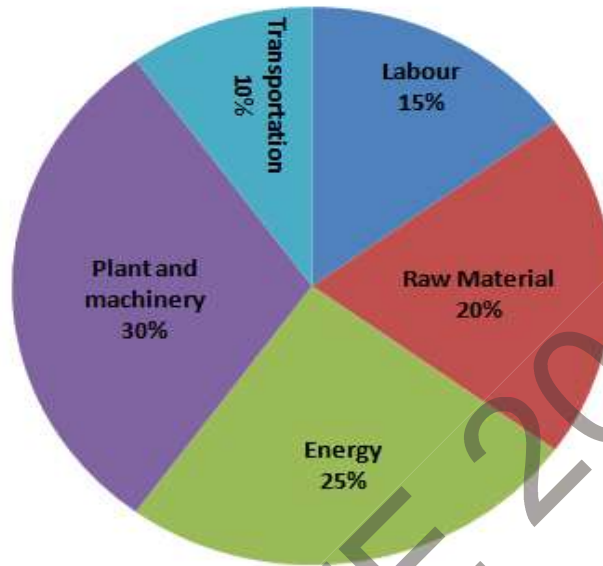
Q.10   A five digit number is formed using the digits 1,3,5,7 and 9 without repeating any of them. What is the sum of all such possible five digit numbers?

(A) 6666660   (B) 6666600   (C) 6666666   (D) 6666606

END OF THE QUESTION PAPER

Q. 1 – Q. 25 carry one mark each.

Q.1   Which one of the following equations is a correct identity for arbitrary 3×3 real matrices P, Q and R?

(A) $P(Q + R) = PQ + RP$

(B) $(P - Q)^2 = P^2 - 2PQ + Q^2$

(C) $\det (P + Q) = \det P + \det Q$

(D) $(P + Q)^2 = P^2 + PQ + QP + Q^2$

Q.2   The value of the integral $\displaystyle\int_0^2 \frac{(x-1)^2 \sin(x-1)}{(x-1)^2 + \cos(x-1)}\, \mathrm{d}x$ is

(A) 3   (B) 0   (C) −1   (D) −2

Q.3   The solution of the initial value problem $\frac{\mathrm{d}y}{\mathrm{d}x} = -2\,x\,y;\quad y(0) = 2$ is

(A) $1 + e^{-x^2}$ (B) $2\,e^{-x^2}$ (C) $1 + e^{x^2}$ (D) $2\,e^{x^2}$

Q.4   A nationalized bank has found that the daily balance available in its savings accounts follows a normal distribution with a mean of Rs. 500 and a standard deviation of Rs. 50. The percentage of savings account holders, who maintain an average daily balance more than Rs. 500 is _____

Q.5   Laplace transform of $\cos(\omega\,t)$ is $\frac{s}{s^2 + \omega^2}$. The Laplace transform of $e^{-2\,t}\cos(4t)$ is

(A) $\dfrac{s-2}{(s-2)^2 + 16}$ (B) $\dfrac{s+2}{(s-2)^2 + 16}$

(C) $\dfrac{s-2}{(s+2)^2 + 16}$ (D) $\dfrac{s+2}{(s+2)^2 + 16}$

Q.6   In a statically determinate plane truss, the number of joints (j) and the number of members (m) are related by

(A) $j = 2m - 3$ (B) $m = 2j + 1$ (C) $m = 2j - 3$ (D) $m = 2j - 1$

Q.7   If the Poisson's ratio of an elastic material is 0.4, the ratio of modulus of rigidity to Young's modulus is _____

Q.8   Which one of the following is used to convert a rotational motion into a translational motion?

(A) Bevel gears   (B) Double helical gears

(C) Worm gears   (D) Rack and pinion gears

Q.9 The number of independent elastic constants required to define the stress-strain relationship for an isotropic elastic solid is _____

Q.10 A point mass is executing simple harmonic motion with an amplitude of 10 mm and frequency of 4 Hz. The maximum acceleration (m/s^2) of the mass is _____

Q.11 Ball bearings are rated by a manufacturer for a life of 10^6 revolutions. The catalogue rating of a particular bearing is 16 kN. If the design load is 2 kN, the life of the bearing will be $p \times 10^6$ revolutions, where p is equal to _____

Q.12 As the temperature increases, the thermal conductivity of a gas

(A) increases   (B) decreases
(C) remains constant   (D) increases up to a certain temperature and then decreases

Q.13 A reversed Carnot cycle refrigerator maintains a temperature of –5° C. The ambient air temperature is 35°C. The heat gained by the refrigerator at a continuous rate is 2.5 kJ/s. The power (in watt) required to pump this heat out continuously is _____

Q.14 A flow field which has only convective acceleration is

(A) a steady uniform flow   (B) an unsteady uniform flow
(C) a steady non-uniform flow   (D) an unsteady non-uniform flow

Q.15 Match Group A with Group B:

Group A	Group B
P: Biot number	1: Ratio of buoyancy to viscous force
Q: Grashof number	2: Ratio of inertia force to viscous force
R: Prandtl number	3: Ratio of momentum to thermal diffusivities
S: Reynolds number	4: Ratio of internal thermal resistance to boundary layer thermal resistance

(A) P-4, Q-1, R-3, S-2   (B) P-4, Q-3, R-1, S-2
(C) P-3, Q-2, R-1, S-4   (D) P-2, Q-1, R-3, S-4

Q.16 Kaplan water turbine is commonly used when the flow through its runner is

(A) axial and the head available is more than 100 m

(B) axial and the head available is less than 10 m

(C) radial and the head available is more than 100 m

(D) mixed and the head available is about 50 m

Q.17   Moist air at 35°C and 100% relative humidity is entering a psychrometric device and leaving at 25°C and 100% relative humidity. The name of the device is

(A) Humidifier   (B) Dehumidifier   (C) Sensible heater   (D) Sensible cooler

Q.18   The total number of decision variables in the objective function of an assignment problem of size $n \times n$ (n jobs and n machines) is

(A) n^2 (B) $2n$ (C) $2n - 1$ (D) n

Q.19   Demand during lead time with associated probabilities is shown below:

Demand	50	70	75	80	85
Probability	0.15	0.14	0.21	0.20	0.30

Expected demand during lead time is _____

Q.20   Within the Heat Affected Zone (HAZ) in a fusion welding process, the work material undergoes

(A) microstructural changes but does not melt

(B) neither melting nor microstructural changes

(C) both melting and microstructural changes after solidification

(D) melting and retains the original microstructure after solidification

Q.21   Two separate slab milling operations, 1 and 2, are performed with identical milling cutters. The depth of cut in operation 2 is twice that in operation 1. The other cutting parameters are identical. The ratio of maximum uncut chip thicknesses in operations 1 and 2 is _____

Q.22   The principle of material removal in Electrochemical machining is

(A) Fick's law   (B) Faraday's laws
(C) Kirchhoff's laws   (D) Ohm's law

Q.23   Better surface finish is obtained with a large rake angle because

(A) the area of shear plane decreases resulting in the decrease in shear force and cutting force
(B) the tool becomes thinner and the cutting force is reduced
(C) less heat is accumulated in the cutting zone
(D) the friction between the chip and the tool is less

Q.24   Match the heat treatment processes (Group A) and their associated effects on properties (Group B) of medium carbon steel

Group A	Group B
P: Tempering	I: Strengthening and grain refinement
Q: Quenching	II: Inducing toughness
R: Annealing	III: Hardening
S: Normalizing	IV: Softening

(A) P-III, Q-IV, R-II, S-I   (B) P-II, Q-III, R-IV, S-I
(C) P-III, Q-II, R-IV, S-I   (D) P-II, Q-III, R-I, S-IV

Q.25   In a rolling process, the maximum possible draft, defined as the difference between the initial and the final thickness of the metal sheet, mainly depends on which pair of the following parameters?

P: Strain
Q: Strength of the work material
R: Roll diameter
S: Roll velocity
T: Coefficient of friction between roll and work

(A) Q, S   (B) R, T   (C) S, T   (D) P, R

Q. 26 – Q. 55 carry two marks each.

Q.26   If z is a complex variable, the value of $\int_{5}^{3i} \dfrac{dz}{z}$ is

(A) $-0.511 - 1.57i$ (B) $-0.511 + 1.57i$
(C) $0.511 - 1.57i$ (D) $0.511 + 1.57i$

Q.27   The value of the integral $\int_{0}^{2}\int_{0}^{x} e^{x+y} dy\, dx$ is

(A) $\dfrac{1}{2}(e-1)$ (B) $\dfrac{1}{2}(e^2-1)^2$ (C) $\dfrac{1}{2}(e^2-e)$ (D) $\dfrac{1}{2}\left(e-\dfrac{1}{e}\right)^2$

Q.28   The number of accidents occurring in a plant in a month follows Poisson distribution with mean as 5.2. The probability of occurrence of less than 2 accidents in the plant during a randomly selected month is

(A) 0.029   (B) 0.034   (C) 0.039   (D) 0.044

Q.29   Consider an ordinary differential equation $\dfrac{dx}{dt} = 4t + 4$. If $x = x_0$ at $t = 0$, the increment in x calculated using Runge-Kutta fourth order multi-step method with a step size of $\Delta t = 0.2$ is

(A) 0.22   (B) 0.44   (C) 0.66   (D) 0.88

Q.30   A shaft is subjected to pure torsional moment. The maximum shear stress developed in the shaft is 100 MPa. The yield and ultimate strengths of the shaft material in tension are 300 MPa and 450 MPa, respectively. The factor of safety using maximum distortion energy (von-Mises) theory is _____

Q.31   A thin gas cylinder with an internal radius of 100 mm is subject to an internal pressure of 10 MPa. The maximum permissible working stress is restricted to 100 MPa. The minimum cylinder wall thickness (in mm) for safe design must be _____

Q.32   For the truss shown in the figure, the forces F_1 and F_2 are 9 kN and 3 kN, respectively. The force (in kN) in the member QS is
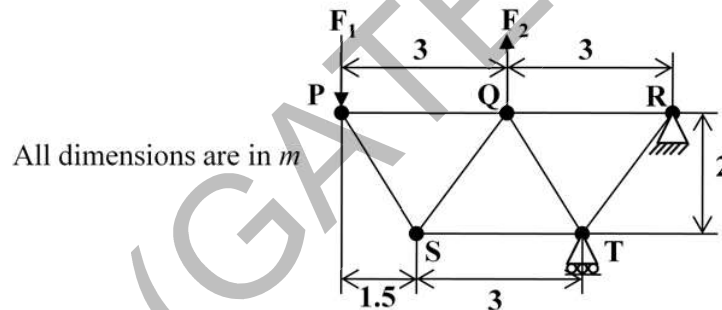

(A) 11.25 tension   (B) 11.25 compression   (C) 13.5 tension   (D) 13.5 compression

Q.33   It is desired to avoid interference in a pair of spur gears having a 20° pressure angle. With increase in pinion to gear speed ratio, the minimum number of teeth on the pinion

(A) increases   (B) decreases
(C) first increases and then decreases   (D) remains unchanged

Q.34   A uniform slender rod (8 m length and 3 kg mass) rotates in a vertical plane about a horizontal axis 1 m from its end as shown in the figure. The magnitude of the angular acceleration (in rad/s²) of the rod at the position shown is _____


1 m   7 m
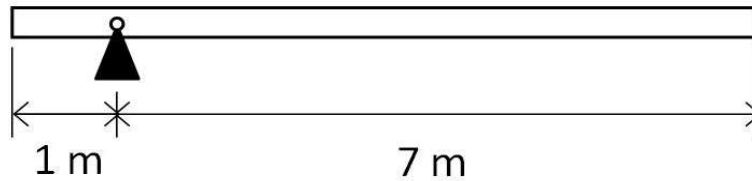
Q.35   A bolt of major diameter 12 mm is required to clamp two steel plates. Cross sectional area of the threaded portion of the bolt is 84.3 mm². The length of the threaded portion in grip is 30 mm, while the length of the unthreaded portion in grip is 8 mm. Young's modulus of material is 200 GPa. The effective stiffness (in MN/m) of the bolt in the clamped zone is _____

Q.36   A frame is subjected to a load P as shown in the figure. The frame has a constant flexural rigidity EI. The effect of axial load is neglected. The deflection at point A due to the applied load P is
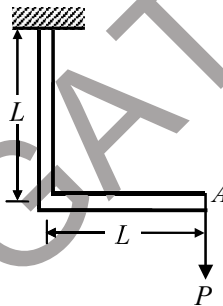

(A) $\dfrac{1}{3}\dfrac{PL^3}{EI}$ (B) $\dfrac{2}{3}\dfrac{PL^3}{EI}$ (C) $\dfrac{PL^3}{EI}$ (D) $\dfrac{4}{3}\dfrac{PL^3}{EI}$

Q.37   A wardrobe (mass 100 kg, height 4 m, width 2 m, depth 1 m), symmetric about the Y-Y axis, stands on a rough level floor as shown in the figure. A force P is applied at mid-height on the wardrobe so as to tip it about point Q without slipping. What are the minimum values of the force (in newton) and the static coefficient of friction μ between the floor and the wardrobe, respectively?
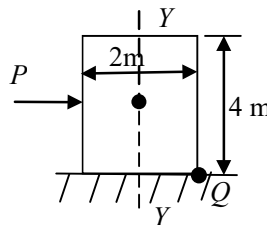

(A) 490.5 and 0.5   (B) 981 and 0.5
(C) 1000.5 and 0.15   (D) 1000.5 and 0.25

Q.38   Torque and angular speed data over one cycle for a shaft carrying a flywheel are shown in the figures. The moment of inertia (in kg.m^2) of the flywheel is _____
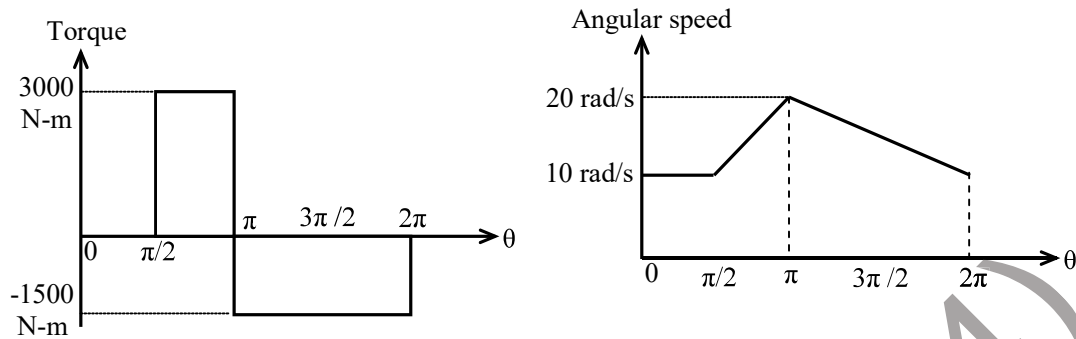
Q.39   A single degree of freedom system has a mass of 2 kg, stiffness 8 N/m and viscous damping ratio 0.02. The dynamic magnification factor at an excitation frequency of 1.5 rad/s is _____

Q.40   A ladder AB of length 5 m and weight (W) 600 N is resting against a wall. Assuming frictionless contact at the floor (B) and the wall (A), the magnitude of the force P (in newton) required to maintain equilibrium of the ladder is _____
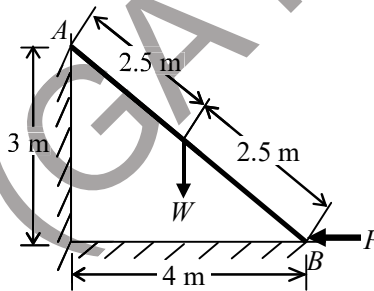
Q.41   A closed system contains 10 kg of saturated liquid ammonia at 10°C. Heat addition required to convert the entire liquid into saturated vapour at a constant pressure is 16.2 MJ. If the entropy of the saturated liquid is 0.88 kJ/kg.K, the entropy (in kJ/kg.K) of saturated vapour is _____

Q.42   A plane wall has a thermal conductivity of 1.15 W/m.K. If the inner surface is at 1100°C and the outer surface is at 350°C, then the design thickness (in meter) of the wall to maintain a steady heat flux of 2500 W/m^2 should be _____

Q.43   Consider the following statements regarding streamline(s):

    (i)   It is a continuous line such that the tangent at any point on it shows the velocity vector at that point

    (ii)   There is no flow across streamlines

    (iii) $\dfrac{dx}{u} = \dfrac{dy}{v} = \dfrac{dz}{w}$ is the differential equation of a streamline, where u, v and w are velocities in directions x, y and z, respectively

    (iv)   In an unsteady flow, the path of a particle is a streamline

Which one of the following combinations of the statements is true?

(A) (i), (ii), (iv)   (B) (ii), (iii), (iv)

(C) (i), (iii), (iv)   (D) (i), (ii), (iii)

Q.44   Consider a velocity field $\vec{V} = K(y\,\hat{i} + x\,\hat{k})$, where K is a constant. The vorticity, Ω_Z, is

(A) – K   (B) K   (C) – K /2   (D) K /2

Q.45   Water flows through a tube of diameter 25 mm at an average velocity of 1.0 m/s. The properties of water are $\rho = 1000 \text{ kg/m}^3$, $\mu = 7.25 \times 10^{-4} \text{ N.s/m}^2$, $k = 0.625 \text{ W/m.K}$, $Pr = 4.85$. Using $Nu = 0.023\, Re^{0.8}\, Pr^{0.4}$, the convective heat transfer coefficient (in W/m².K) is _____

Q.46   Two identical metal blocks L and M (specific heat = 0.4 kJ/kg.K), each having a mass of 5 kg, are initially at 313 K. A reversible refrigerator extracts heat from block L and rejects heat to block M until the temperature of block L reaches 293 K. The final temperature (in K) of block M is _____

Q.47   Steam with specific enthalpy (h) 3214 kJ/kg enters an adiabatic turbine operating at steady state with a flow rate 10 kg/s. As it expands, at a point where h is 2920 kJ/kg, 1.5 kg/s is extracted for heating purposes. The remaining 8.5 kg/s further expands to the turbine exit, where $h = 2374$ kJ/kg. Neglecting changes in kinetic and potential energies, the net power output (in kW) of the turbine is _____

Q.48   Two infinite parallel plates are placed at a certain distance apart. An infinite radiation shield is inserted between the plates without touching any of them to reduce heat exchange between the plates. Assume that the emissivities of plates and radiation shield are equal. The ratio of the net heat exchange between the plates with and without the shield is

(A) 1/2   (B) 1/3   (C) 1/4   (D) 1/8

Q.49   In a compression ignition engine, the inlet air pressure is 1 bar and the pressure at the end of isentropic compression is 32.42 bar. The expansion ratio is 8. Assuming ratio of specific heats (γ) as 1.4, the air standard efficiency (in percent) is _____

Q.50 The precedence relations and duration (in days) of activities of a project network are given in the table. The total float (in days) of activities e and f, respectively, are

Activity	Predecessors	Duration (days)
a	-	2
b	-	4
c	a	2
d	b	3
e	c	2
f	c	4
g	d, e	5

(A) 0 and 4   (B) 1 and 4   (C) 2 and 3   (D) 3 and 1

Q.51 At a work station, 5 jobs arrive every minute. The mean time spent on each job in the work station is 1/8 minute. The mean steady state number of jobs in the system is _____

Q.52 A GO-No GO plug gauge is to be designed for measuring a hole of nominal diameter 25 mm with a hole tolerance of ± 0.015 mm. Considering 10% of work tolerance to be the gauge tolerance and no wear condition, the dimension (in mm) of the GO plug gauge as per the unilateral tolerance system is

(A) $24.985^{+0.003}_{-0.003}$ (B) $25.015^{+0.000}_{-0.006}$ (C) $24.985^{+0.03}_{-0.03}$ (D) $24.985^{+0.003}_{-0.000}$

Q.53 A cylindrical riser of 6 cm diameter and 6 cm height has to be designed for a sand casting mould for producing a steel rectangular plate casting of 7 cm × 10 cm × 2 cm dimensions having the total solidification time of 1.36 minute. The total solidification time (in minute) of the riser is _____

Q.54 A cast iron block of 200 mm length is being shaped in a shaping machine with a depth of cut of 4 mm, feed of 0.25 mm/stroke and the tool principal cutting edge angle of 30°. Number of cutting strokes per minute is 60. Using specific energy for cutting as 1.49 J/mm³, the average power consumption (in watt) is _____

Q.55 A butt weld joint is developed on steel plates having yield and ultimate tensile strength of 500 MPa and 700 MPa, respectively. The thickness of the plates is 8 mm and width is 20 mm. Improper selection of welding parameters caused an undercut of 3 mm depth along the weld. The maximum transverse tensile load (in kN) carrying capacity of the developed weld joint is _____

END OF THE QUESTION PAPER