

GATE 2012 Online Examination
AG : AGRICULTURAL ENGINEERING

Duration: Three Hours

Maximum Marks: 100

Read the following instructions carefully.

1. The computer allotted to you at the examination center runs a specialized software that permits only one answer to be selected for multiple choice questions using a mouse. Your answers shall be updated and saved on a server periodically and at the end of the examination.
2. To login, enter your Registration Number and password provided in the envelope. Go through the symbols used in the test and understand the meaning before you start the examination. You can view all questions by clicking on the View All Questions button in the screen after the start of the examination.
3. To answer a question, select the question using the selection panel on the screen and choose the correct answer by clicking on the radio button next to the answer. To change the answer, just click on another option. If you wish to leave a previously answered question unanswered, click on the button next to the selected option.
4. The examination will automatically stop at the end of 3 hours.
5. There are a total of 65 questions carrying 100 marks. Except questions Q.26 – Q.30, all the other questions are of multiple choice type with only **one** correct answer. Questions Q.26 - Q.30 require a numerical answer, and a number should be entered using the virtual keyboard on the monitor.
6. Questions Q.1 – Q.25 carry 1 mark each. Questions Q.26 – Q.55 carry 2 marks each. The 2 marks questions include two pairs of common data questions and two pairs of linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is unattempted, then the answer to the second question in the pair will not be evaluated.
7. Questions Q.56 – Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1 mark each, and questions Q.61 – Q.65 carry 2 marks each.
8. Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE** marks. There is no negative marking for questions of numerical answer type, i.e., for Q.26 – Q.30. For all 1 mark questions, $\frac{1}{3}$ mark will be deducted for each wrong answer. For all 2 marks questions, $\frac{2}{3}$ mark will be deducted for each wrong answer. However, in the case of the linked answer question pair, there will be negative marks only for wrong answer to the first question and no negative marks for wrong answer to the second question.
9. Calculator is allowed. Charts, graph sheets or tables are **NOT** allowed in the examination hall. Do the rough work in the Scribble Pad provided.
10. You must sign this sheet and leave it with the invigilators at the end of the examination.

DECLARATION: I hereby declare that I have read and followed all the instructions given in this sheet.

| | | | | | | | | |
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| Registration Number | AG | | | | | | | |
| Name | | | | | | | | |
| Signature | | | | | | | | |

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| Verified that the above entries are correct. Invigilator's signature: | |
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- Q.11 The tangent line to $y = f(x)$ at the point (x_0, y_0) , assuming $f'(x) \neq 0$, intersects the x axis at
- (A) $(x_0 - [y_0/f'(x_0)], 0)$ (B) $(x_0 + [y_0/f'(x_0)], 0)$
(C) $(x_0 - [f'(x_0)/y_0], 0)$ (D) $(x_0 + [f'(x_0)/y_0], 0)$
- Q.12 Approximate percentage of scores that fall within $\pm\sigma$ (standard deviation) of the mean in a normal distribution is
- (A) 34 (B) 68 (C) 95 (D) 99
- Q.13 The integrating factor of the differential equation $(x+1) \frac{dy}{dx} - y = \sin x$ is
- (A) x (B) $(x+1)$ (C) $1/x$ (D) $1/(x+1)$
- Q.14 The constituent of producer gas which occupies the highest percentage by volume and helps in increasing its overall calorific value is
- (A) CO (B) CO₂ (C) H₂ (D) CH₄
- Q.15 During field operation, the shank of a tractor drawn rigid tyne sweep type cultivator is mainly subjected to
- (A) bending (B) shear (C) torsion (D) bending and torsion
- Q.16 A slider is moving on a straight link at a sliding velocity of 0.5 m s^{-1} . The straight link is pivoted at one end and makes angular movement at a rate of 1.0 rad s^{-1} . Coriolis acceleration of the slider in m s^{-2} is
- (A) 0.25 (B) 0.50 (C) 1.00 (D) 4.00
- Q.17 The power developed and the exhaust gas temperature of a diesel engine compared to a spark ignition engine of the same size and running at the same speed respectively, are
- (A) higher and lower (B) higher and higher
(C) lower and higher (D) lower and lower
- Q.18 In a semi-modular outlet, the discharge
- (A) is independent of water levels in the distributary and the water course
(B) depends upon the water levels of both distributary and water course
(C) depends upon the water level in the distributary
(D) depends upon the water level in the water course
- Q.19 The relationship between outflow Q in $\text{m}^3 \text{ s}^{-1}$ and storage S in m^3 for an emergency spillway in a reservoir is $Q = S/4000$. Inflow, outflow and storage are assumed to be zero at time $t = 0$. If the inflow rate is $300 \text{ m}^3 \text{ s}^{-1}$ at the end of $t = 3$ hours, the outflow rate in $\text{m}^3 \text{ s}^{-1}$ is
- (A) 152.84 (B) 164.84 (C) 172.34 (D) 184.84
- Q.20 A trapezoidal grassed waterway is constructed along a longitudinal gradient of 4%. If the cross-sectional area of flow is 1.52 m^2 , wetted perimeter is 12.5 m and Manning's n for the waterway is $0.04 \text{ m}^{-1/3} \text{ s}$, the flow through the waterway in $\text{m}^3 \text{ s}^{-1}$ is
- (A) 1.9 (B) 2.1 (C) 2.3 (D) 2.5

- Q.21 A single acting reciprocating pump discharges 3.5 litres of water per second at 40 rpm. The pump has a piston diameter of 150 mm and a stroke of 300 mm. The percentage slip is
 (A) 0.85 (B) 1.97 (C) 3.53 (D) 6.05
- Q.22 A pair of parallel glass panes, each of 3 mm thickness traps 2 mm layer of stagnant air. Thermal conductivities of glass and air are 0.5 and $0.02 \text{ W m}^{-1} \text{ K}^{-1}$, respectively. If the film heat transfer coefficient of air is $10 \text{ W m}^{-2} \text{ K}^{-1}$, then Biot Number is
 (A) 1.50 (B) 1.00 (C) 0.06 (D) 0.04
- Q.23 Two small parallel plane square surfaces, each measuring $4 \text{ mm} \times 4 \text{ mm}$ are placed 0.5 m apart (centre to centre) with 30° angle between the radial distance and both the surface normals. The view factor between the two surfaces is
 (A) 1.53×10^{-5} (B) 1.76×10^{-5} (C) 3.82×10^{-3} (D) 4.41×10^{-3}
- Q.24 Tomato catsup with 10 Pa s^n consistency coefficient and 0.8 flow behaviour index is flowing in a pipe. Generalized coefficient of viscosity of catsup, in Pa s^n is
 (A) 2.66 (B) 6.93 (C) 15.91 (D) 23.87
- Q.25 A packed bed of 480 kg solid particles having particle size of 0.15 mm and density of 800 kg m^{-3} is fluidized using air at 25°C and 1 atmospheric pressure. If the cross section of the empty bed is 0.45 m^2 and voidage at minimum fluidizing condition is 0.5, then the minimum height of the fluidized bed, in m is
 (A) 7.4 (B) 5.4 (C) 2.7 (D) 1.0

Q. 26 to Q. 55 carry two marks each.

- Q.26 The value of $\int_0^{\pi/2} \cos x \, dx$ using trapezoidal rule with two equal intervals is
 (A) 0.95 (B) 1.00 (C) 1.22 (D) 1.29
- Q.27 A tractor power take-off (PTO) driven stationary peg tooth type wheat thresher operating at a cylinder speed of 540 rpm requires a torque of 250 Nm at PTO. The minimum net engine power required, in kW is
 (A) 13 (B) 16 (C) 18 (D) 21
- Q.28 A border strip of $8 \times 250 \text{ m}$ is being irrigated by a border stream of 50 lps. The infiltration capacity of the soil is 25 mm h^{-1} (assumed to be constant throughout the period of irrigation). The average depth of the advancing sheet of water over the land is 70 mm. The time required to irrigate the border strip, in minutes, will be
 (A) 16.7 (B) 25.7 (C) 54.7 (D) 67.7
- Q.29 Decimal reduction times for *Bacillus subtilis* are 37 s and 12 s at temperatures of 120°C and 125°C , respectively. The temperature rise, in $^\circ \text{C}$, necessary to reduce the first value of decimal reduction time at 120°C by a factor of 10 is
 (A) 7.18 (B) 10.36 (C) 13.06 (D) 16.07

- Q.62 The total runs scored by four cricketers P, Q, R, and S in years 2009 and 2010 are given in the following table:

| Player | 2009 | 2010 |
|--------|------|------|
| P | 802 | 1008 |
| Q | 765 | 912 |
| R | 429 | 619 |
| S | 501 | 701 |

The player with the lowest percentage increase in total runs is

- (A) P (B) Q (C) R (D) S
- Q.63 If a prime number on division by 4 gives a remainder of 1, then that number can be expressed as
- (A) sum of squares of two natural numbers
(B) sum of cubes of two natural numbers
(C) sum of square roots of two natural numbers
(D) sum of cube roots of two natural numbers

- Q.64 Two points $(4, p)$ and $(0, q)$ lie on a straight line having a slope of $3/4$. The value of $(p - q)$ is
- (A) -3 (B) 0 (C) 3 (D) 4

- Q.65 **In the early nineteenth century, theories of social evolution were inspired less by Biology than by the conviction of social scientists that there was a growing improvement in social institutions. Progress was taken for granted and social scientists attempted to discover its laws and phases.**

Which one of the following inferences may be drawn with the greatest accuracy from the above passage?

Social scientists

- (A) did not question that progress was a fact.
(B) did not approve of Biology.
(C) framed the laws of progress.
(D) emphasized Biology over Social Sciences.

END OF THE QUESTION PAPER